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MALCOLM (D. H.). **Virus diseases of Tobacco.**—*Tasm. J. Agric.*, N.S., vii, 2, pp. 57–60, 3 figs., 1936.

During the past season severe losses from tomato spotted wilt [*R.A.M.*, xiv, p. 129; xv, p. 324] were sustained by tobacco planters in the Derwent Valley of Tasmania. The symptoms and etiology of the disease (the diagnosis of which is stated to have been confirmed by H. R. Angell) are described in popular terms, with practical recommendations for its control.

During the season of 1934–5 some 20 per cent. of the plants in the same district were affected by mosaic, the severity of which, however, appears to have recently declined.

TROTTER (A.). **Il 'verderame' dei Tabacchi in cura.** ['Verderame' of curing Tobaccos.]—*Boll. tec. Tab.*, xxxiii, 2, pp. 67–72, 4 pl., 1936. [English summary.]

Two types of the greenish-blue discoloration known as 'verderame' [verdigris] have been observed on curing tobacco in Italy, viz., the speckled and spotted, the former consisting of minute spherical or angular lesions, 1 to 2 mm. in diameter, distributed in rows along the parenchyma in proximity to the veins, and the latter of larger (up to 1 cm.), circular, slightly raised spots, of a less vivid colour than the foregoing, and not localized on any special part of the leaf. This condition would appear, from the writer's observations, to be a sequel to severe field infection by mosaic and other forms of infectious chlorosis.

BÖNING (K.). **Massnahmen zur Bekämpfung des Wildfeuers an Tabak.** [Measures for the control of Tobacco wildfire.]—*Dtsch. landw. Pr.*, lxiii, 21, pp. 261–262, 7 figs., 1936.

The measures found efficacious by the writer in the control of tobacco wildfire [*Bacterium tabacum*] at the Bavarian Agricultural Institute, Munich, have already been summarized from another source [*R.A.M.*, xv, p. 61].

SMALL (T.). **Diseases of outdoor-grown Tomatoes in Jersey.**—*J. Minist. Agric.*, xliii, 2, pp. 117–124, 5 figs., 1936.

The most serious disease of outdoor tomatoes in Jersey, where about 1,800 to 2,000 acres are planted every year, is blight (*Phytophthora infestans*) [*R.A.M.*, xv, p. 556], which occurs regularly and has been

shown experimentally to pass from tomato to potato and from late, but not readily from early, potatoes to tomato.

Stem rot (*Didymella lycopersici*) [ibid., xiii, p. 403] comes next in importance to blight, and occurs at a critical period when the plants bear three or four trusses of ripening fruit. In most cases death rapidly ensues, the numbers killed on three experimental plots each of 300 plants in 1934, for example, being 110, 137, and 152, respectively. The disease also attacks the fruits on otherwise healthy plants, causing fruit drop, and a pycnidial stage resembling that of *D. lycopersici* was found on potato stems at the end of the season. Control measures are indicated, including the use of seed from healthy plants only, and other plant sanitation methods [ibid., xii, p. 663].

Damping-off is caused by species of *Phytophthora* and by *Corticium solani*; foot rot, caused by the latter fungus, occurs after the seedlings have been planted in the field. Leaf mould (*Cladosporium fulvum*) [ibid., xiv, p. 79] causes damage only in sheltered, low-lying, moist areas. Wilt (*Verticillium albo-atrum*) [ibid., xiv, p. 283] is now rare, as a result of the disinfection of the canes with formaldehyde. Grey mould (*Botrytis cinerea*) is always present, but serious only in wet seasons. Other diseases recorded are the three physiological disorders, blossom-end rot [ibid., xv, p. 537], green back [ibid., xiii, p. 663], and blotchy ripening [ibid., xv, p. 539]; leaf spot (*Septoria lycopersici*) [ibid., xiv, p. 492], target spot (*Macrosporium* [*Alternaria*] *solani*) on the young foliage [ibid., x, p. 564; xiv, p. 563], spotted wilt [ibid., xiv, p. 492], *Sclerotinia sclerotiorum*, which occurs occasionally both on indoor and outdoor crops, the root rots caused by *Thielaviopsis basicola* [ibid., xv, p. 613] and *Colletotrichum atramentarium* [ibid., xi, p. 767], and the fruit rots caused by *Pleospora herbarum*, *A. tenuis*, and *Fusarium equiseti*.

GUBA (E. F.). **Resistance to Cladosporium fulvum.**—*Phytopathology*, xxvi, 4, pp. 382–386, 1936.

The author gives a concise, fully documented survey of the progress made in the development of tomatoes resistant to *Cladosporium fulvum* [*R.A.M.*, xv, p. 481], and concludes that there are good prospects of bringing this important commercial enterprise to a successful conclusion. A bibliography of 37 titles is appended.

BRIEN (R. M.) & CHAMBERLAIN (E. E.). **Tomato seedling damping-off. I. Control by soil treatment.**—*N.Z. J. Agric.*, lii, 5, pp. 257–267, 5 figs., 1936.

Tomato seedling damping-off, associated with *Pythium ultimum* and *Corticium vagum* [*C. solani*: *R.A.M.*, xii, pp. 232, 643; cf. also xiv, pp. 383, 671], of which the former is the more prevalent and injurious, has for some years been a troublesome disease in New Zealand, where it was first recorded in 1924. In tests [the results of which are tabulated] of a large number of soil treatments complete control was given in all cases by steam sterilization, with no ill effect on germination; formalin (1·25 per cent. solution) also gave complete control, but slightly delayed germination, probably because insufficient time was allowed to elapse between soil treatment and sowing; mercurous chloride (0·067 per cent.

suspension) controlled *C. solani* but not *P. ultimum*, and was injurious to the seed; acetic acid (1 per cent.) gave partial control of both fungi; and the other substances were inferior.

Of the treatments tested only steam disinfection and the application of 1·25 per cent. formalin solution are recommended. With the former, a temperature of from 180° to 200° F. for 20 minutes is effective. Where steaming facilities are not available the formalin treatment may be substituted, the soil being saturated, and the excess solution drained off; the soil should then be allowed to stand and be occasionally turned over until all odour of formaldehyde has evaporated, this requiring at least two weeks.

GOIDÀNICH (G.). **Intorno ad una 'Phytophthora' causante un marciume del colletto nel Pomodoro.** [On a *Phytophthora* causing a collar rot in the Tomato.]—*R.C. Accad. Lincei*, xxiii, 7, pp. 512–514, 1936.

Phytophthora parasitica is believed to be the agent of a virulent chestnut-coloured collar rot of tomato seedlings [*R.A.M.*, xiv, pp. 194, 263; xv, p. 615] near Rome, first observed in the spring of 1935. The papillate sporangia of the fungus measured 27 to 46 by 22 to 39 μ (average 36 by 28 μ). On a maize meal medium at P_H 6·11 the flocculent, dendroid colonies attained a diameter of 25 to 30 mm. in 96 hours at 35° C., and one of 3 to 8 mm. at 37°. These particulars are in agreement with Tucker's observations on *P. parasitica* [ibid., xii, p. 594]. It was found impossible to induce the reproductive phase. Mutants differing from the parent colonies in cultural and physiological features developed in one culture of the fungus.

Infection was contracted by plants inoculated in the greenhouse at 20°, but the actual symptoms of the disease were not reproduced, probably on account of the relatively low temperature.

The disease was readily controlled in the seed-bed (it did not spread to the field) by the incorporation in the irrigation water of a small quantity of copper sulphate.

GAGE (G. R.). **A second report on the status of the Dutch Elm disease.**—*J. Tenn. Acad. Sci.*, xi, 2, p. 141, 1936.

The number of elm trees affected by the Dutch disease [*Ceratostomella ulmi*] in the United States [*R.A.M.*, xv, p. 328] up to 15th November, 1935, is given as follows: New Jersey, 9,079 (corresponding figure up to 10th October, 1934, 4,940), New York 4,762 (2,420), Connecticut 132 (56), Ohio, Indiana, Maryland, and Virginia (together) 35 (17), making a total of 14,008 (7,433).

COLLINS (C. W.), BUCHANAN (W. D.), WHITTEN (R. R.), & HOFFMANN (C. H.). **Bark beetles and other possible insect vectors of the Dutch Elm disease Ceratostomella ulmi (Schwarz) Buisman.**—*J. econ. Ent.*, xxix, 1, pp. 169–176, 1936.

After describing the life-histories of *Scolytus multistriatus* and *Hylurgopinus rufipes*, which are stated to be particularly well adapted on biological grounds to the transmission of *Ceratostomella ulmi* from diseased to healthy elms [see preceding and next abstracts], the writers

give details of experiments to determine the part played by these and other insects in the conveyance of the fungus from tree to tree. From the data presented it is apparent that infection was transmitted only by *S. multistriatus* and *H. rufipes*, *C. ulmi* being recovered from previously healthy trees on which the beetles were allowed to feed, from egg galleries made in previously non-infected logs by the insects after contact with diseased material, and from adults (6 out of 29 *S. multistriatus* and 1 out of 14 *H. rufipes*) collected while crawling on elms in the field in 1935 in heavily infested areas of New Jersey. Six trees infected by *C. ulmi* bore no evidence of attack by either bark beetle and one contained only one gallery of *H. rufipes*.

Brief notes are given on the progress to date in combating the disease by means of sanitation plots, chemical treatment of elm stumps, and insecticides.

WORTHLEY (L. H.). **Progress in Dutch Elm disease eradication.**—*J. econ. Ent.*, xxix, 1, pp. 176–181, 1936.

Of the 18 elms infected by *Graphium* [*Ceratostomella ulmi*: see preceding abstracts] detected during the summer of 1935 in cities remote from the major infected area [*R.A.M.*, xv, pp. 129, 326], 10 were in Indianapolis [Indiana], 2 each in Cleveland [Ohio] and Norfolk [Virginia], 1 at Portsmouth in the same region as the Norfolk infection, and 3 at Brunswick, Maryland, the last-named centre constituting the only new isolated focus disclosed by the current year's scouting activities. The number of trees definitely diagnosed in 1935 as harbouring *C. ulmi* was 6,036, nearly 400 fewer than in 1934, and only 39 in which the presence of the disease was recently confirmed remained standing at the end of October. Since the discovery of Dutch elm disease in the United States in 1930 the total number of cases of infection amounts to 13,969. As a result of the 1935 inspections, the known infected zone has been extended by 47 per cent., the largest proportional increase being in New York. All diseased elms found in the tri-State area outside the previous year's infected zone are within a 50-mile radius of Columbus Circle in New York City.

GRAVES (A. H.). **Forest pathology.**—*Rep. Brooklyn bot. Gdn, 1935* (*Brooklyn bot. Gdn Rec.*, xxv, 2), pp. 62–75, 1 pl., 1936.

In these further notes on the hybrids between Japanese and Chinese chestnuts (*Castanea crenata* and *C. mollissima*) resistant to blight (*Endothia parasitica*) and the American chestnut (*C. dentata*) [*R.A.M.*, xiv, p. 611] it is stated that the best hybrid so far obtained, a Japanese-American, is now four years old and stands 11 ft. 2 in. high, compared with a normal height of 4 ft. for an American chestnut of the same age. There are 116 hybrid trees now being grown at Hamden, representing eight combinations of chestnut species and varieties. During 1935 successful crosses have been made, *inter alia*, between three Smith hybrids 1931 and *C. mollissima*, 10 Japanese forest type (*C. crenata* var.) and American chestnut, 1 *C. crenata* var. and Chinese chinquapin (*C. seguinii*), and 15 'S 8' (apparently a combination of *C. crenata* and *C. pumila*) and American chestnut.

Strong (F. C.). **Maple wilt.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xviii, 4, pp. 225–227, 1936.

Maple wilt caused by an unidentified species of *Verticillium* [cf. *R.A.M.*, xiv, p. 265] has become prevalent during the last ten years in Michigan, where the kinds most commonly attacked are the hard maples and Norway maple [*Acer platanoides*], though box-elder [*A. negundo*], red maple [*A. rubrum*], and sometimes silver maple [*A. saccharinum*] are also susceptible. The symptoms vary considerably with the variety and condition of the tree and other factors. Leaf wilt is fairly common but the leaves soon die and drop off. The branches often die during the dormant season. The presence of a dark green discoloration in the wood is an almost certain indication of the presence of the fungus [ibid., xii, p. 338]. The application of fertilizers in early stages of the disease, accompanied by ample watering where necessary, resulted in a marked, but possibly only temporary, improvement in growth.

Bongini (Virginia). **Revisione critica di alcuni micocecidi dell' Ontano.** [A critical revision of certain gall-producing fungi attacking Alders.]—*Boll. Lab. sper. e Reg. Oss. Fitopat. Torino* [formerly *Difesa Piante*], xiii, 1–2, pp. 1–10, 2 graphs, 1936.

In her study of the Exoasceae attacking alders in Italy the author points out that by general agreement among recent workers all the Exoasceae found on this host belong to *Taphrina*, of which five species have been recorded as producing leaf galls, viz., *T. tosquinetii*, *T. sadebeckii*, *T. epiphylla*, *T. borealis*, and *T. klebahni* [*R.A.M.*, xiii, p. 453]. Both *T. borealis* and *T. epiphylla* are, however, regarded as synonyms of *T. sadebeckii*, which is distinguished from *T. tosquinetii* by dimensions of the asci. In 1935, *T. sadebeckii* was common on alder leaves in Piedmont.

Cone galls measuring 0·5 to 2·5 or 3 cm. in diameter are produced by *T. alni-incanae* [ibid., vi, p. 762] which differs from *T. tosquinetii* in having sessile asci. The latter does not occur on the cones. *T. alnitorqua* Robins is synonymous with *T. alni-incanae*, while *T. alnitorquus* Tul., which has been thought to be a synonym of *T. alni-incanae*, is really synonymous with *T. tosquinetii*.

Langner (W.). **Untersuchungen über Lärchen-, Apfel- und Buchenkrebs.** [Investigations on Larch, Apple, and Beech canker.]—*Phytopath. Z.*, ix, 2, pp. 111–145, 10 figs., 1 diag., 1936.

A tabulated account is given of the writer's investigations to determine the correctness or otherwise of Day's theory that larch canker is primarily due to frost injury [*R.A.M.*, xi, p. 140], *Dasyscypha willkommii* [ibid., xv, p. 618] being without appreciable importance in the etiology of the disease. The experimental portion of the work was carried out at the Bavarian Forestry Experiment Station, Munich, and supplementary studies were made at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg.

Evidence was obtained that the fungus cannot penetrate the living tissues under any circumstances and Day's observation that every

case of larch canker is initiated by frost injury to the cambium was fully confirmed, though the author cannot subscribe to the opinion that *D. willkommii* is entirely devoid of significance in the disturbance. As soon as the vital activities of the cortex cease in the autumn, the fungus is able in fairly warm weather to secrete an enzyme and so to disorganize but not to kill the adjacent healthy tissue. With the advent of frost the tissue so affected is killed and into it the fungus penetrates saprophytically. If the weather continues mild a further frost-sensitive zone may be formed and the process repeated several times, especially in the spring. On the basis of these investigations, therefore, *D. willkommii* cannot be designated either as a parasite, a perthophyte [ibid., ix, p. 47], or a pure saprophyte [ibid., vii, p. 210], and the writer has therefore coined to express its activities the term 'thryptophyte'. To this category in future should be referred all fungi acting in such a manner on the host as to enhance its vulnerability to external agencies, which pave the way for actual fungal penetration.

The frost-sensitive zone arises through the conversion of osmotically active cell substances into relatively inactive tannin, involving a significant reduction in the osmotic concentration of the tissue and an accompanying loss of resistance to frost. At the same time there is an appreciable influx towards the cankered zone of plastic substances and water. The advance of the fungus is not generally arrested by the cork layer unless the latter is so far raised above the living tissue as to create a gap between the healthy and infected portions.

The cankers of apple and beech caused, respectively, by *Nectria galligena* and *N. ditissima* [ibid., xiii, p. 732], bear a general resemblance to that of the larch, but no decision was reached as to the interaction of frost and fungal infection in these diseases.

Owens (C. E.). **Studies on the wood-rotting fungus, Fomes pini. II. Cultural characteristics.**—*Amer. J. Bot.*, xxiii, 4, pp. 235–254, 6 pl., 1 graph, 1936.

Continuing his studies on *Fomes* [= *Trametes*] *pini* [*R.A.M.*, xv, p. 543], the writer tabulates and discusses the variations in cultural characters in 80 isolations of the fungus from six genera and 19 species of coniferous hosts.

Three main groups, each containing minor variations, were differentiated on the agar media used (malt, potato dextrose, oat, and maize meal), viz., (*a*) a majority group including isolations from *Larix occidentalis*, *Pinus contorta*, *P. lambertiana*, *P. monticola*, *P. palustris*, *P. resinosa*, *P. strobus*, *P. taeda*, *Picea rubra*, *P. sitchensis*, *Pseudotsuga taxifolia*, and *Tsuga mertensiana*, characterized by a rapid growth rate and thick, flocculent, predominantly buff-coloured colonies on malt agar; (*b*) isolations from *Abies grandis*, differing from the foregoing in their relatively slow growth and sparser, somewhat darker-coloured mycelial mats; and (*c*) a third category, comprising isolations from *Pinus ponderosa* and *T. heterophylla*, which are similar to those of (*a*) in growth rate but differ from them in the deeper brown colour and more compact, felty texture of the mycelium.

On wood blocks of *Pseudotsuga taxifolia* extensive delignification was caused by strains of the fungus from the same host, *Picea sitchensis*,

and *Pinus monticola*, whereas the wood was not attacked by those from *A. grandis* and barely touched by the isolations from *P. palustris* and *T. mertensiana*. On *A. grandis* blocks, isolations from *P. palustris* and *T. mertensiana* caused the most delignification, followed by those from *A. grandis*, while the *P. monticola*, *Pseudotsuga taxifolia*, and *Picea sitchensis* strains were much less active in this respect.

The habit of growth of *F. pini* on *A. grandis* and the cultural characters of isolations of the fungus from this host indicate that the latter is distinct from that on various other conifers and from that on some other species of *Abies*, but the available evidence is insufficient definitely to identify the *A. grandis* form as *F. pini* (Thore) Lloyd var. *abietis* Karst.

Inoculations on living trees were unsuccessful, possibly because of the extensive impregnation of the heartwood by resin in the young material used.

Gistl (R.). **Zur Physiologie des 'echten Hausschwammes' (Merulius lacrymans domesticus Falck).** [On the physiology of the 'true dry rot fungus' (*Merulius lacrymans domesticus* Falck).]—*Arch. Mikrobiol.*, vii, 2, pp. 177–187, 2 graphs, 1936.

Nitrates at concentrations up to 0·5 mol. (optimum 0·3) were found to constitute the best sources of nitrogen for *Merulius lacrymans* in wheat chaff cultures, ammonium salts giving a yield only one-third as large. Sulphates at 0·5 mol., calcium salts up to 0·3, and magnesium salts up to 0·1 also promoted growth. *M. lacrymans* produced large quantities of growth-promoting substances [*R.A.M.*, xv, p. 309] in these tests, the yield of yeast cultures being raised 3,300 times in relation to the untreated controls by the introduction of an aqueous extract of the dry rot organism.

Bryan (J.). **Methods of applying wood preservatives. Part I. Non-pressure methods.**—*For. Prod. Res. Rec., Lond.*, 9, 17 pp., 4 figs., 1 diag., 2 graphs, 1936.

Concise instructions are given for the impregnation of constructional timber by three methods, viz., the more or less superficial brush treatment, steeping, and the open tank hot and cold process [cf. *R.A.M.*, x, p. 700; xi, p. 815; xv, p. 332, *et passim*].

Frosch (C. J.). **Chemical studies of wood preservation. VIII. The correlation of the distillation range with the penetration of creosote into paper strips.**—*Physics*, vii, 5, pp. 167–178, 1 diag., 4 graphs, 1936.

Measurements of the penetration tensions in paper of a series of creosotes distilled from a single coal-tar [*R.A.M.*, xiv, p. 806] are reported, the penetration tension being the product of the surface tension and the cosine of the contact angle, which in the case of creosote is shown to be zero or extremely minute. Possible errors in the paper strip method are discussed and the importance of calibrating each strip with a reference liquid (benzene was used in these experiments) is demonstrated. The penetration tensions of these creosotes remain unchanged in the presence of adsorbed water.

ZHAVORONKOVA (Mme I. P.). Бактериоз Цветной Капусты. [Bacteriosis of the Cauliflower.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 116–126, 4 figs., 1935. [Received July, 1936.]

Cauliflowers (usually grown in the greenhouse in the neighbourhood of Leningrad) are stated to be severely attacked, especially in moist years, by *Bacterium maculicola* McCulloch [*R.A.M.*, xv, pp. 4, 70]; the disease first came into prominence in that region, as well as in Crimea and the Caucasus, in 1930 and 1931, when the local agricultural authorities started enforcing the production of home-grown cauliflower seed. Field observations and controlled infection experiments showed that the plants may be attacked at any stage of development; in greenhouses, the first symptoms usually appear on the leaves, but in certain years the heads may be the first to show the signs of infection. On plants left over for seed, all parts of the flowering shoots are attacked, and the bacterium eventually penetrates the seeds which become black. In the greenhouse artificial infection of healthy cauliflower leaves and heads only succeeded at a temperature of 25° to 26° C. Further tests showed that the disease is transmitted by the seeds and to some extent through the soil. Good commercial control was obtained by steeping the seed before sowing in 1 per cent. mercurized aniline solution for 25 minutes, or in 1 per cent. mercuric chloride for 10 minutes. Inside the infected seeds, the bacterium was shown to be present just below the testa and occasionally inside the first superficial layer of the cotyledons.

BORMANS (P.). **Les méthodes de sélection de la Betterave à sucre et la génétique.** [Methods of selection of Sugar Beet and genetics.]—*Bull. Ass. Chim. Sucr.*, liii, 5, pp. 417–438, 1 graph, 1936. [English and German summaries.]

In connexion with a discussion on hereditary factors in relation to sugar beet breeding, the writer briefly draws attention to the discouraging results hitherto obtained in all attempts to develop varieties truly resistant to *Cercospora beticola* [*R.A.M.*, xv, p. 550]. At the two breeding establishments under the author's supervision in France, all cases of apparent immunity were subsequently found to be due to anomalies or irregularities in the development of infection associated with slight fluctuations in the environmental conditions, to which the plant is highly sensitive.

NEUWEILER (E.). **Die Bekämpfung der Herzkrankheit der Runkelrüben.** [The control of heart rot of Beets.]—*Landw. Jb. Schweiz*, l, 3, pp. 273–291, 2 figs., 1936. [French summary.]

During the period from 1932 to 1935 experiments were carried out at the Federal Agricultural Experiment Station, Oerlikon, Zürich, to determine the value of boron in the control of heart rot of beets [*R.A.M.*, xv, pp. 1, 626]. In six out of eight field tests the application of boric acid to the soil gave promising results, the improvement in the health of the plants being proportionate to the amounts given up to 12 kg. per hect., though even at this maximum rate the disease was not entirely eliminated. Contrary to the results of the preliminary

laboratory trials, borax (12 or 20 kg.) gave satisfactory control in the field, while a mixture of 4·4 kg. borax and 4 kg. copper sulphate was moderately effective. All the treatments resulted in increased yields and augmented the dry matter and sugar contents of the roots. The time of application (whether at planting or immediately on detection of the symptoms) appears to be of minor importance. The immersion of the seed-clusters for two hours in 0·25 per cent. abavit or germisan or in 0·25 or 0·5 per cent. boric acid improved the condition of the plants, presumably by stimulating them to overcome the ill effects of boron deficiency.

The efficacy of the boron treatment depends on the constitution of the soil, being less in the very severely affected bog and sandy loam types than in clay loam or sandy clay. The disease may be favoured by excessive applications of boron. In practice, boric acid (12 kg. per hect.) will be found preferable to borax on account of the ease with which it may be mixed with the fertilizer and strewn over the fields at planting time.

Stapp (C.) & Hähne (H.). **Zur Frage der Resistenz von Buschbohnensorten gegen den Erreger der Fettfleckenkrankheit Pseudomonas medicaginis var. phaseolicola Burkh.** [On the question of the resistance of dwarf Beans to the agent of the grease spot disease, *Pseudomonas medicaginis* var. *phaseolicola* Burkh.]—*Angew. Bot.*, xviii, 3, pp. 249–262, 1936.

Continuing the senior writer's studies on varietal reaction to grease spot (*Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) [*R.A.M.*, xiv, p. 415; cf. also xv, p. 191] in dwarf bean (*Phaseolus vulgaris*) samples of diverse origin, 360 lots of 56 varieties were tested in the greenhouse at the headquarters of the National Biological Institute, Dahlem, Berlin, and 476 specimens of the same number of varieties in the field at the Aschersleben [Saxony] branch.

The tabulated results of the trials show that of 320 samples of susceptible varieties at least 20 per cent. sprang from infected seed. A high degree of susceptibility as judged by both methods was manifested by Hinrichs Riesen speckled, St. Andreas, Peterseims Siedlerstolz, Riesen Flageolet 800, Riesen Schecken [Speckled], Ruhm von Thüringen, and the Wachs selections, Amtsrat Koch (stringless), Beste von Allen (Brittle), Erfurter Markt (stringless), Erntesegen, and Herbstsegen. A satisfactory degree of resistance for all practical purposes was shown by Doppelte Holländische Prinzess, Allerfrüheste Weisse, Erfurter Konservenwunder, Hundert für Eine, stringless Konserva, stringless Zucker Perl Perfection, Kaiser Wilhelm, Kaiser Wilhelm Riesen, Schlachtschwert (extra broad), and Nordstern.

A number of varieties showed greater susceptibility in the greenhouse than in the field, while with others the positions were reversed.

Scott Watson (J. A.). **Notes on manuring.**—*J. Minist. Agric.*, xliii, 2, pp. 178–181, 1936.

In this paper the author states that potash deficiency, in certain cases at least, predisposes beans [*Vicia faba*] to attacks of chocolate spot (*Botrytis*) [*R.A.M.*, xiv, p. 734]. Very encouraging results, making

the difference between a very severe and a very mild attack, were obtained by applying a dressing of 1½ cwt. per acre of muriate of potash or an equivalent potash salt.

COWIE (G. A.). **'Chocolate spot' in Beans.**—*Fertil. Feed. St. J.*, xxi, 5, p. 182, 1 fig., 1936.

The results of manurial trials in Buckinghamshire, Sussex, and elsewhere are stated to have shown that chocolate spot of broad beans [*Vicia faba*], believed to be mainly due in England to *Botrytis* [see preceding abstract], is largely controllable by the application to the soil of potash (in the form of kainit, 6 cwt. per acre, or of muriate of potash, 1½ cwt., in the two instances for which particulars are cited). In the Sussex tests on Hastings Beds (potash-deficient) soil the plants in the untreated beds were devastated by the disease, while those receiving potash, though showing the chocolate spots, resisted the action of the fungus in a striking manner.

WHITE (H. L.). **Diseases of early vegetables.**—*Rep. exp. Res. Sta. Cheshunt, 1935*, pp. 42–43, 1936.

Crown rot of rhubarb, associated with an organism apparently corresponding with *Bacillus rhaponticum* [*R.A.M.*, xiii, p. 288], was prevalent in 1934 and 1935 in a field near Cheshunt, where the diseased plants were observed to be distributed along the lines of planting. It was found that plants grown from sets replanted without storage were much less affected than those from sets stored for varying intervals; and furthermore the sets planted earliest and stored for the shortest period were those least affected.

RODIGIN (M. N.). Об иммунитете Тыквы к антракнозу. [On the immunity of the Vegetable Marrow from anthracnose.]—*Тр. Быковской зон. опытн. Станции Бахчеводства.* [*Trans. Bykovskaya regional exp. Sta. Cult. of Cucurbits*], Stalingrad [Tsaritzin], *1935*, 3, pp. 59–76, 2 figs., 1935. [Received May, 1936.]

Anthracnose (*Colletotrichum lagenarium*) [*R.A.M.*, xiv, p. 344] of vegetable marrow (*Cucurbita pepo*) appears to be restricted to the Astrakhan district of U.S.S.R., though market produce originating from this district may, of course, be found infected elsewhere; a specimen collected at Kieff in 1907 is preserved in Leningrad. Several years' careful investigations of the fungus in the laboratory, confirmed by numerous inoculation experiments, showed that while the form on the melon, watermelon, and cucumber is morphologically indistinguishable from that found on the vegetable marrow, the former is incapable of attacking the vegetable marrow, while the latter is also pathogenic to the other cucurbits. Considerable differences were also observed in the behaviour of the two forms in pure culture on gelatine and agar media. The melon form (which is provisionally designated as strain α) grew abundantly on malt extract–peptone–gelatine, on which it formed orange-coloured acervuli, and later dark sclerotia. The vegetable marrow form (strain β) developed equally well on this medium, but did not produce acervuli; it developed instead typical fertile pycnidia. Strain α refused to grow on a malt extract–1 per cent. peptone agar

medium with 0·05 per cent. citric acid added; on this medium strain β grew well forming sclerotium-like fructifications of the acervulus type. In general, strain α was shown to require for its development complex albumins and certain sugars with a definite C/N ratio, while strain β was considerably less exacting in its nutritional relationships. Further tests showed that strain α produced appressoria freely in vegetable marrow juice and in unfavourable media, whereas strain β did not form appressoria in any of the media tested. It is believed, therefore, that the production of appressoria by strains of *C. lagenarium* in juice from cucurbitaceous hosts may indicate immunity in these hosts from the given strain.

A comparison of the two strains of *C. lagenarium* with a specimen of *Gloeosporium orbiculare* on vegetable marrow [ibid., xii, p. 418] received from W. G. Farlow and preserved in Leningrad showed that the latter species is entirely distinct.

Kalashnikoff (K. J.). **Trichothecium roseum Link** на Огуречных растениях в защищенном грунту. [*Trichothecium roseum* Link on Cucumber plants under glass.]—*Pl. Prot. Leningr., 1935*, 7, pp. 136–139, 1935. [English summary. Received May, 1936.]

Cucumbers grown under glass in the Leningrad area were severely attacked in the early spring of 1935 by a wet rot of the stem, leaf, and flower, which isolations and artificial inoculation experiments showed to be caused by *Trichothecium roseum*. Controlled investigations indicated that the attack was chiefly due to unfavourable environmental conditions (temperature falling below 17° C. during the night, poor lighting and ventilation, and excessive atmospheric humidity) in the glasshouses, under which the plants were considerably weakened and became etiolated. The first symptoms appeared on the cotyledons, whence they spread to the stems, leaves, and flowers. No secondary parasitic organisms were isolated from the diseased plants. The trouble should be easily preventable by maintaining conditions under glass favourable to the growth of the cucumbers, in conjunction with strict sanitary measures.

Klyushnikova (Mme E. S.), Vyatkina (Mme A. G.), Vassilieff (A. V.), & Zuckermann (R. V.). Общие условия культуры Шампиньона, грунты, расовый состав и прорастание спор. [General conditions for the cultivation of Mushrooms; substrata, varieties, and germination of spores.]—*Wiss. Ber. moskau. St. Univ., 1935*, 4, pp. 218–265, 6 figs., 1 diag., 7 graphs, 1935. [English summary. Received July, 1936.]

In tests made at Moscow of various substitutes for horse manure as a substratum for the cultivation of mushrooms (*Psalliota campestris*), the best yields were given by an admixture of 50 per cent. sawdust to the manure. Chemical analysis showed that the highest content in protein is found in mushrooms grown on a mixture of manure and tree leaves, and the lowest in mushrooms from manure plus sawdust. It was also determined that a series of changes occurs in the composition of the substratum according to the stage of development of the fungus, these changes agreeing with those established by Waksman, except that

cellulose and lignin accumulate in the manure instead of diminishing [*R.A.M.*, xii, p. 138].

The authors differentiate four varieties of the cultivated mushroom, namely, smooth white, white scale, brown, and the 'blond' variety (pink and yellow). Pure cultures of the four varieties have been obtained by germination of the spores after ten days at least on Lambert's agar, and by tissue transfers.

CHAZE (J.). **Compléments à l'étude des propriétés humorales du Champignon de couche envers la môle.** [Addenda to the study of the humoral properties of the edible Mushroom in relation to the 'môle'.]—*C.R. Acad. Sci., Paris*, ccii, 18, pp. 1529–1531, 1936.

The writer has experimentally demonstrated the presence in the cells of the carpophore, as well as in those of the hymenium of *Psalliota* [*campestris*], of thermolabile diffusible antitoxins inhibiting the development of *Mycogone* [*perniciosa*: *R.A.M.*, xv, p. 628].

KOVAČEVSKI (I. C.). Чернилката по Нахута **Mycosphaerella rabiei n.sp.** [The blight of Chick Pea, *Mycosphaerella rabiei* n.sp.]—Issued by Min. Agric. nat. Domains, Sofia, 80 pp., 4 pl., 1936. [English summary.]

A detailed and fully tabulated account is given of the author's laboratory and field studies of chick pea (*Cicer arietinum*) blight (*Ascochyta rabiei*) [*R.A.M.*, xv, p. 198], which is stated to be of considerable economic importance in southern Bulgaria, where it usually accounts for 20 to 50 per cent. of the crop, and occasionally involves the total failure of certain chick pea fields. In a detailed morphological description of the pycnidial stage (for which the generic name *Ascochyta* is preferred to *Phyllosticta*), the conidia are stated to be rarely (under 1 per cent.) septate, and to measure 6 to 16 by 3·4 to 5·6 μ on the host and 4·8 to 14 by 3·2 to 5·2 μ on artificial media. Perithecia of the fungus (the genetic connexion of which with the pycnidial stage was demonstrated both in pure culture and by inoculation experiments) were found exclusively on chick pea refuse, especially the pods, that had overwintered in the field. They are dark brown or black, globose or applanate, with a hardly perceptible beak and ostiole, 76 to 152 μ high, and 120 to 250 μ wide at their broadest portion. The asci are cylindrical-clavate, more or less curved, pedicellate, and 48 to 70 by 9 to 13·7 μ in diameter. The ascospores (eight to the ascus) are monostichous, rarely distichous, hyaline, ovoid, divided into two very unequal cells, strongly constricted at the septum, and measure 12·5 to 19 by 6·7 to 7·6 μ. The name *Mycosphaerella rabiei* is suggested for the perithecial form [but no Latin diagnosis is given].

Attempts to control the disease by hot water or chemical seed disinfection were unsuccessful, but three or four sprayings of the growing plants with 1 per cent. Bordeaux mixture or preferably with 1 in 40 lime-sulphur considerably reduced the severity of the disease; it is believed, however, that the most effective control is only obtainable by the use of healthy seed produced in isolated farms, protected from outside infection.

Golding (F. D.). **Cassava mosaic in Southern Nigeria.**—*Eleventh Bull. agric. Dep. Nigeria*, pp. 1–10, 1 fig., 1936.

Observations made in 1929 in Southern Nigeria showed that cassava plants with mosaic-diseased leaves on all branches yielded about 30 per cent. less than healthy plants [*R.A.M.*, xi, p. 152; xv, p. 342]; plants with diseased leaves on one branch yielded as much as healthy plants, indicating that the infection was of recent origin. The yield of two varieties introduced from Ibadan was respectively about twice and four times as much as from infected local cassava grown in contiguous plots, but 88 per cent. of the one and 42 to 59 per cent. of the other became affected within four months of planting. Roguing is impracticable over large areas in Southern Nigeria owing to dense vegetation. Spread is favoured by the native growers' use of cuttings from affected plants, and the author cites Joly's suggestion that seed should be used [ibid., x, p. 640].

Though transmission experiments with *Bemisia* sp. (the only insect abundantly present on cassava in south-western Nigeria) gave negative results, the author states in a footnote that he subsequently proved that the new species *B. nigeriensis* Corbett is a vector of cassava mosaic [ibid., xv, p. 72].

Du Plessis (S. J.). **Studies on the wastage of export Grapes with special reference to that caused by Botrytis cinerea, Pers.**—*Sci. Bull. Dep. Agric. S. Afr.* 151, 156 pp., 7 pl., 1 diag., 14 graphs, 1 map, 1936. [Afrikaans summary.]

In this full account of studies on the wastage of South African export grapes, with special reference to the form associated with infection by *Botrytis cinerea* (some of the results of which have already been noticed from another source [*R.A.M.*, xiv, p. 491]), the author gives descriptions of the various types of wastage and the fungi causing them, including besides the organisms previously identified, *Penicillium cyclopodium*, *P. expansum*, *P. elongatum*, *Aspergillus carbonarius*, *A. niger*, *Fusarium oxysporum* var. *aurantiacum* [ibid., xiv, pp. 72, 585; xv, p. 428], *Cladosporium baccae* [ibid., x, p. 408], and *Sphaeropsis malorum* Berk. [*Physalospora mutila*: see below, p. 726].

Comparative cultural studies with seven monospore isolations of *B. cinerea*—four from grapes and one each from apple, pear, and quince—revealed marked differences in sugar requirements, growth rate, colony characters, conidial and sclerotial production, conidial dimensions on potato dextrose, meat, and Conn's glucose asparaginate agar, and pathogenicity to Delicious and Rokewood apples and Barlinka grapes. On the basis of these disparities the strains under observation are regarded as entitled to varietal rank. *Botrytis* infection of grapes in the vineyard was found to be favoured by long periods of high humidity and the physiological condition of the grapes is thought to be one of the main factors affecting the occurrence of the disease both in the vineyard and in storage. The rotting caused by *Botrytis*, *Penicillium*, and *Cladosporium* increased directly with the mechanical injury to the grapes, which was found to be partly due to handling and transport subsequent to packing. Heavy or late application of

nitrogenous fertilizers, and to a certain extent potassic fertilizers increased susceptibility of Henab Turki grapes to wastage, but phosphatic fertilizers increased resistance. The amount of wastage was found to vary with the amount of nitrogen in the berry.

The relative efficiency of the various fungicides was compared on the basis of an index of control, calculated as $\frac{(a-p)+(b-q)+(c-r)+(d-s)}{a+b+c+d}$, where a, b, c, d are the average percentages of infection of bunches in the control boxes showing +, ++, +++, and ++++ amounts of mechanical damage, respectively, and p, q, r, s = average percentages of infection of treated bunches showing similar categories of mechanical damage. The classification of the data according to the varying amounts of damage in the bunches was considered essential for the proper interpretation of the results. On the basis of results obtained in 1933 to 1935 the author concludes that verderame sulphur was the best dust for the control of *Botrytis* rot in storage, whereas copper sulphur dust was most effective for the *Penicillium* storage rots but was not so good against *Botrytis* in storage, though satisfactory in the field. No control of the other types of wastage was obtained. Though the efficacy of the copper sulphur dust increased with the number of applications, not more than one or two would be worth while in moderately dry seasons. Iodized wrappers, prepared according to the formula of Tomkins [ibid., xiv, p. 321], reduced the amount of *Botrytis* rot considerably and are recommended as easily applicable and fairly effective. Fumigation with 4 per cent. formaldehyde for one hour or spraying the bunches, wrappers, or wood wool with a 4 per cent. solution also yielded promising results. Ripe and especially overripe grapes were much more susceptible to *Botrytis* and other storage rots than greener ones.

Shatsky (A. L.). Лечение Виноградной лозы от мильдью по инкубационным периодам. [Treatment of downy mildew of the Vine on the basis of incubation periods.]—*Pl. Prot. Leningr.*, *1935*, 6, pp. 75–85, 1 graph, 1935. [English summary. Received July, 1936.]

The author states that under the environmental conditions which generally obtain in the vine-growing areas of the U.S.S.R., the portion of Müller's curve of the incubation period of downy mildew (*Plasmopara viticola*) [*R.A.M.*, xv, p. 477] that needs to be taken into consideration in forecasting outbreaks of the disease may be represented by the formula $h(t-8) = 60$, in which h is the number of days of the incubation period, and t is the average mean daily temperature for that period. This formula is claimed to be sufficient for the theoretical computation of the length of the incubation periods at temperatures ranging from 10° to 24° C. Since, however, the length of the incubation periods varies more rapidly with slight fluctuations of the lower (near 10°) than of the higher (near 24°) temperatures, a greater precision is obtained by using for the first three or four incubation periods the corrected formula $h = \frac{60\,(t-8)}{(t-16)\,64\,D'}$, in which h is the length in days

of the incubation period, t is the mean day temperature of the day on which infection occurred, and D is the increase in the mean daily temperature for a period of 30 days, both the two last-stated values being established on the base of meteorological records for a period of many years. Details are further given of the method by which the author proposes to compile 'incubation calendars' for the various vine-growing regions. Good control of the mildew should be obtainable by treating the vines one or two days before the end of the first, third, and fifth incubation periods, and so on until about the end of June.

WORMALD (H.). **Notes on plant diseases in 1935.**—*Rep. E. Malling Res. Sta., 1935*, pp. 142–145, 1936.

Of the plant diseases investigated at East Malling in 1935 [*R.A.M.*, xiv, p. 617] the following may be mentioned. *Pyrus purpureum* shrubs growing at Sedlescombe, Sussex, were affected by blossom wilt (*Sclerotinia laxa*), and the fruit of the same host in two other localities was attacked by *S. fructigena*. Medlars were severely infected by *S. mespili* [ibid., v, p. 109; vi, p. 619].

Top-grafted apple trees in various localities developed a cankered condition referred to as 'papery bark', associated in some cases with silvering of the foliage. *Stereum purpureum* was isolated from the discoloured wood and fructifications of this species developed on cankered branches when cut and exposed in the open, these facts suggesting that this fungus may be responsible for the disease.

Strawberries at Westerham showed symptoms resembling those of Lanarkshire disease [*Phytophthora* (?) *cinnamomi*, ibid., xv, p. 450]; the 'red core' condition was noted in the roots, and oospores were present.

Cherries were severely affected by bacterial canker, and Morello cherries [*Prunus cerasus*] developed a bacterial leaf spot associated with an organism which differed from *Pseudomonas prunicola* and *P. mors-prunorum* [ibid., xv, p. 139]. Other varieties of acid cherries were similarly affected, many flower clusters being killed on the Carnation variety.

From lesions on the shoots and leaves of *Forsythia* sp., an organism resembling *P. syringae* was isolated, inoculations with which into young lilac shoots gave definite lesions.

GALLOWAY (L. D.). **India: new plant diseases recorded in 1935.**—*Int. Bull. Pl. Prot.*, x, 6, pp. 121–122, 1936.

The following are among the items of interest in this list of new phytopathological records for India in 1935: *Helminthosporium sativum* [*R.A.M.*, xv, p. 86] causing black point of wheat, anthracnose of *Crotalaria juncea* (*Colletotrichum curvatum*) [ibid., ix, p. 187], *Urocystis sorosporioides* on *Delphinium* sp., *Ravenelia mitteri* on *Indigofera leptostachya* (the last-named reported by J. H. Mitter), and *Hendersonina sacchari* (?) [ibid., x, p. 223] on tea seedlings (reported by A. C. Tunstall).

WALLACE (G. B.). **Plant pathology.**—*Rep. Dep. Agric. Tanganyika, 1935*, pp. 104–113, 1936.

In this report [cf. *R.A.M.*, xiv, p. 678] it is stated that in preliminary trials on the control of coffee rust (*Hemileia vastatrix*) in the Northern

Province, where spraying as a rule is advisable, the value of spraying in maintaining healthy foliage was very marked. The best results were obtained with 0·8 or 1·0 per cent. Bordeaux mixture plus linseed oil, groundnut oil, or sulphite lye as a spreader. A few trees showed signs of resistance to the disease and are being propagated for testing.

A dry collar rot of coffee was reported from two plantations in the Usambara mountains on *Coffea arabica* only. Plants are affected when about 16 to 18 months old and turn yellow, become defoliated, die back, and may break at the collar and fall over. A characteristic swelling of the collar is observed at or below ground level. There are indications that the mealy-bug (*Pseudococcus brevispinosus*) may be implicated in the cause of the disease.

A strain of *Botrytis cinerea* was associated with warty disease of old 'cherries' in three localities, but its economic importance is as yet uncertain.

Black chaff of wheat (*Bacterium translucens* var. *undulosum*) [ibid., xv, p. 489], identified by J. McDonald, was recorded for the first time and *Puccinia anomala* occurred on barley in the Usambara mountains.

Both vine powdery mildew (*Uncinula necator*) and downy mildew (*Plasmopara viticola*) were present in Usambara and the latter in the Moshi district. Crown gall (*Bacterium tumefaciens*) was destructive to almond, plum, peach, pear, and apple and *Puccinia pruni-spinosae* [ibid., xv, p. 590] was found on plum. *Ascochyta phaseolorum* [ibid., xii, p. 330] is recorded on Lima bean (*Phaseolus lunatus*), a new host, and a mildew of lentils is referred provisionally to *Erysiphe polygoni*.

HOPKINS (J. C. F.). **Annual report of the Senior Plant Pathologist for the year ending 31st December, 1936.**—*Rhod. agric. J.*, xxxiii, 6, pp. 413–421, 1936.

The following are among the items of interest in this report [cf. *R.A.M.*, xiv, p. 677]. The excessive rains of the early part of the 1934–5 season checked the growth of tobacco and frog eye (*Cercospora nicotianae*) [ibid., xv, p. 612] became well established on the lower leaves of all plants. Later, under dry conditions, most of the crop suffered from nitrogen deficiency and the remaining, chlorotic leaves soon became attacked. The slow development of the young plants resulted in heavy infection by mosaic, and pruning against frog eye before mosaic symptoms appeared spread the disease indiscriminately.

Severe infections by strawberry mildew [? *Sphaerotheca humuli*: ibid., xiv, p. 493], apple mildew [*Podosphaera leucotricha*: ibid., ix, p. 628], and tomato leaf spot (*Septoria lycopersici*) [ibid., xv, p. 690] occurred during the year.

The leaf curl disease found on wild species of *Sida* was successfully transmitted to cotton by budding and grafting.

G. M. Wickens reports that a tobacco leaf spot (associated with a *Phyllosticta* on the larger spots only) was rather common and is suspected to be due to a virus, non-transmissible by sap inoculations. A maize disease resembling streak [ibid., xiv, p. 626] occurred locally and appreciably reduced yields. A survey in the Umbali district showed that almost 100 per cent. infection may occur on one farm whilst another, only a few miles away, may be free from the disease. Heavy

mortality among locusts was due to infection by *Empusa grylli* [ibid., xv, p. 499].

New records made in 1935 include *Fusarium coeruleum* on potato, root rot of pansy (*Rhizoctonia* [*Corticium*] *solani*), *Puccinia pelargonii-zonalis* on geranium [*Pelargonium*: ibid., xv, p. 509], *Armillaria mellea* on apple, plum, and cherry, and *R. bataticola* (*Macrophomina phaseoli*) [ibid., xv, p. 632] on sweet potato.

STELL (F.). **Report of Mycologist, 1935.**—*Rep. Dep. Agric. Trin. Tob. 1935*, pp. 47–50, 1936.

This report [cf. *R.A.M.*, xv, p. 75] contains, *inter alia*, the following items of phytopathological interest. Cacao witches' broom (*Marasmius perniciosus*) has now been present in Trinidad for quite eight years, but there are still substantial areas free from the condition, and even larger districts in which the disease exists only in a mild, sporadic form. In some localities incidence is rather higher, and certain estates, occupying a large acreage, in low-lying areas where streams are present, are heavily infected. If cacao prices do not rise planters in these last zones should seriously consider replacing cacao by other crops. On the Government cacao estate at Marper diseased material was collected and destroyed every alternate month, instead of every month, as formerly; the new method was quite effective and is recommended for general adoption. The loss on the estate of mature pods owing to the disease was still under 2 per cent. The search for resistant trees and observations on non-infected trees previously noted have been continued but at the end of the year only 2 quarter trees and 14 full trees remained free from the disease.

The incidence of cacao black pod (*Phytophthora*) [*palmivora*: ibid., xv, pp. 561, 634] was normal in 1935 but the author considers that losses would be greatly reduced by attention to drainage in localities liable to floods.

The locally made oil used for destroying banana stools affected by Panama disease [*Fusarium oxysporum cubense*: ibid., xv, p. 664] has been found quite effective and satisfactory; only stools obviously diseased are treated. The Gros Michel banana is affected locally by leaf spots due to *Cercospora musae* [ibid., xv, p. 450] and *Cordana* sp. [*Scolecotrichum musae*: ibid., xv, p. 281]. The former is widely distributed and has been found also on the Giant Governor, Governor, and Sucrier varieties. The last-named variety, grown for ground shade in cacao fields, is severely attacked and probably constitutes the chief source of infection. The fungus does most damage to plants growing in exposed situations on poor soil, little damage being caused in fertile, well-watered, sheltered localities.

Tonka bean [*Dipteryx odorata*] thread blight [ibid., xiv, p. 256] was controlled by reducing excessive shade and destroying affected material.

Forty-eighth Annual Report Rhode Island State College Agricultural Experiment Station. Contribution 483.—40 pp., 1936.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xiv, p. 562]. The lawn grasses damaged in 1934 by

Rhizoctonia [*Corticium*] *solani* were again severely attacked in 1935, mainly between 9th and 25th July. Snow mould [*Calonectria graminicola*: ibid., xiv, p. 588] also developed in a virulent form in late March and April. Two new grass diseases were observed, namely, a distinct type of snow mould known as 'ring patch' and a peculiar 'dollar spot' associated with a sclerotial fungus, neither of which was controllable by mercurial treatments effective against the other troubles under investigation. The hosts of *Corticium fuciforme* [ibid., xiv, p. 587], the agent of 'pink patch', have been found to include hard fescue [*Festuca ovina* var. *duriuscula*], annual and Kentucky bluegrass [*Poa annua* and *P. pratensis*], quake grass [*Briza media*], redtop [*Agrostis alba*], the seaside and velvet bents [*A. palustris* and *A. canina*], and colonial bents. The minimum, optimum, and maximum temperatures for the development of the fungus are 1°, 20°, and 30° C., respectively. It was found to be capable of withstanding 18 months' exposure to a temperature of 25° and 10 days to one of 35°, while growth is resumed after 90 days at 0°. *C. fuciforme* grows best on beer wort agar at P_H 4·9 and on potato dextrose at 5·6, forming on the latter a pale pink mycelium, while on Williams's medium the coloration is deeper or more vivid.

Lime-sulphur (1 in 40 or 1 in 50) was found to cause a greater reduction of carbon assimilation in apple than flotation sulphur paste (1 in 55) or any of the other materials used for the control of scab (*Venturia inaequalis*) [ibid., xv, p. 484 and below, p. 726]. The disease was adequately combated by a schedule in which lime-sulphur (1 in 40) was followed by flotation sulphur after the calyx application.

Leaf spot and late blight of tomatoes [*Septoria lycopersici* and *Phytophthora infestans*] were controlled by four applications, at fortnightly intervals from 24th July, of coposil [ibid., xv, p. 666], red copper oxide [ibid., xv, p. 552], Burgundy mixture, ammonium copper carbonate, and Bordeaux mixture (1–1–50, 2–2–50, neutral, 4–4–50, 4–5–50, and 4–6–50). Of these treatments, only coposil and the first two Bordeaux combinations improved the quality of the staked fruit, while Burgundy (5–5–50) caused visible burning injury. The best yield of the staked plants was given by plots treated with 4–4–50 Bordeaux, and of the unstaked by plots treated with red copper oxide and ammonium copper carbonate.

Chargraff (E.) & Levine (M.). **Chemical composition of Bacterium tumefaciens.**—*Proc. Soc. exp. Biol.*, xxxiv, 5, pp. 675–677, 1936.

From a virulent strain of *Bacterium tumefaciens* [*R.A.M.*, xv, p. 560] cultured on sterile bean broth in the dark at room temperature for 14 days, washed, and suspended in a mixture of equal amounts of alcohol and ether, the writers isolated a yellow, viscous, oily, acetone-soluble fat, apparently containing unsaturated fatty acids of high molecular weight, and a phosphatide consisting of a sticky, yellow powder with a melting-point at 125° [C.]. From the defatted bacteria a polysaccharide was obtained containing some 65·3 per cent. of reducing sugars (calculated as glucose). Preliminary tests on Paris daisy [*Chrysanthemum frutescens*], geranium [*Pelargonium*], and *Ricinus* [*communis*] indicate that the phosphatide exerts a growth-stimulating action, in which respect the fat is much less active.

Săvulescu (T.). **L'immunité aux maladies bactériennes des plantes.** [Immunity from bacterial diseases of plants.]—*Arch. roum. Path. exp. Microbiol.*, ix, 2, pp. 209–281, 1936.

The most important conclusions arising out of this comprehensive survey (followed by a bibliography of 318 titles) of the literature on immunity from bacterial diseases in plants have already been summarized from another source [*R.A.M.*, xv, p. 677].

Peltier (G. L.), Yount (M.), & Suneson (C. A.). **The stem rust epidemic of 1935 in Nebraska.**—*Plant Dis. Reptr, Suppl.* 91, 18 pp., 1 pl., 23 maps, 1936. [Mimeographed.]

A detailed account is given of the severe epidemic of wheat stem [black] rust (*Puccinia graminis tritici*) [*R.A.M.*, xv, p. 631] which developed in Nebraska in 1935. The yield of spring wheat averaged only 9 bush. per acre for the entire State, and 60 per cent. of the loss of yield is attributed to stem rust; the corresponding figures for winter wheat were 13 bush. and 50 per cent. The sequence of factors necessary for an epidemic of stem rust are stated to be delayed seeding (spring wheat) or delayed early spring development (winter wheat), late heading and ripening, and a long fruiting period with weather favouring extensive infection occurring about the earing time of the winter grains. These conditions synchronize only in occasional years, and the possibility of stem rust epidemics occurring in the future should not be allowed to interfere with the continued eradication of barberry in the Great Plains area west of the Mississippi. By breeding rust-resistant wheats for those areas in Texas where the uredospores normally overwinter infection from this source will also be reduced. Only when both sources of rust are effectively controlled can occasional epidemics be expected to cease.

Roberts (Florence M.). **The determination of physiologic forms of Puccinia triticina Erikss. in England and Wales.**—*Ann. appl. Biol.*, xxiii, 2, pp. 271–301, 1936.

A tabulated account is given of studies from 1932 to 1934, inclusive, at Cambridge of the reactions of 46 collections of *Puccinia triticina* [*R.A.M.*, xv, p. 492] (all of which, except three from Portugal, were made in England and Wales) on the differential wheat varieties Webster, Hussar, Democrat, Mediterranean, Malakoff, Loros, Carina, and Brevit. Ten new forms (66 to 75, inclusive) were isolated, the first eight of which were determined in material from Great Britain and the last two in that from Portugal. From British material form 66 was isolated fourteen times, form 15 seven times, form 67 five times, form 70 twice, and forms 69, 71, 72, and 73, together with form 10, once only each. Form 10 was found in the greenhouse as a variant of form 66, this being stated to be the first recorded instance of mutation in pathogenicity in *P. triticina*. It is suggested that mutation may account for the occurrence in Great Britain of the hitherto undescribed physiological forms of the rust, in spite of the apparent absence there of susceptible species of *Thalictrum*. Form 66 differed from any of the other forms encountered in the apparent inherent instability of the reaction produced on Hussar wheat, which abruptly changed from a resistant to a susceptible type,

a change which could not be satisfactorily correlated with environmental conditions or with a mixture of cultures.

The reactions of some of the differential hosts to certain physiological forms were affected by changes in environmental conditions [ibid., xv, p. 562]. Thus, for instance, excessively high temperatures during incubation, on the one hand, and decreased light intensity combined with lower temperatures, on the other hand, were responsible for the abnormal production of a type '*x*' reaction on certain of the differential varieties. Low light intensity and low temperatures appeared to be associated with an increase in resistance in the normally susceptible reactions of many varieties, the first factor being apparently the more important of the two, while increased temperature and light intensity tended to modify the normally resistant reactions of some other varieties towards susceptibility; resistance appeared, however, to be less sensitive to fluctuations in environmental conditions than susceptibility. The normal resistance of certain wheat varieties, e.g., Malakoff, Webster, and Democrat, to some of the forms was reduced by infection with mildew (*Erysiphe graminis*) [ibid., xiv, p. 88].

Stefanovski (I. A.). **Influence of environmental factors on immunity of Wheat.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., ii, 8, pp. 341–345, 1936.

A summarized account is given of field experiments at the Krasnokutsk (Lower Volga basin) Plant Breeding Station, in which the effect was tested of the date of sowing and of cultural practices on the intensity of attack by brown rust (*Puccinia triticina*) [*R.A.M.*, xv, pp. 562, 571] on a world collection of 135 wheat samples. The results showed that the incidence of the rust sharply increased with the retardation of the date of sowing from 9 per cent. showing the maximum degree of infection (Vaviloff's scale) among the early-sown, to 42 per cent. among the medium sown, and 48 per cent. among the late-sown. Under irrigated conditions the incidence of rust markedly increased (e.g., the percentage of samples showing the maximum degree of infection was 9 under arid conditions and 72 under irrigation), but the majority of varieties resistant when late sown retained their immunity even though irrigated. Under irrigation the varieties of durum wheats originating in the Mediterranean belt and neighbouring countries, such as Tunisia, Algeria, Palestine, Syria, Trans-Jordan, and Portugal, were the most resistant to the rust. Yarovization [vernalization: cf. ibid., xv, p. 489] appeared to reduce the incidence of the rust in certain early-sown varieties, but increased it in some others. In late sown wheats the rust incidence was for the most part increased by vernalization, owing to a lack of uniformity in the development of the treated plants.

Caldwell (R. M.) & Stone (G. M.). **Relation of stomatal function of Wheat to invasion and infection by leaf rust (Puccinia triticina).**—*J. agric. Res.*, lii, 12, pp. 917–932, 3 pl., 1 fig., 1936.

This is a full report of the authors' study of the relation existing between the function of the host stomata and the invasion and infection of wheat seedlings by leaf [brown] rust (*Puccinia triticina*), an abstract from which has already been noticed from another source [*R.A.M.*, xi, p. 440].

Kalé (F.). **Résistance relative des Blés au Puccinia glumarum Eriks. et Henn. dans la région versaillaise.** [Relative resistance of Wheats to *Puccinia glumarum* Eriks. & Henn. in the region of Versailles.] —*Ann. Épiphyt.*, N.S., ii, 1, pp. 14–19, 1 fig., 1936.

In this paper the author describes a technique devised by him for studying the hydrogen-ion concentration of the cell contents of certain wheat varieties susceptible or resistant to *Puccinia glumarum*. The method used consists in mounting thick transverse sections of the leaf in water and observing the reaction obtained in the living cell after the introduction by means of a micro-pipette (0·5 to 1·5 μ in diameter at the end) of an indicator, phenol red in distilled water giving the best results. The experiments were carried out on various dates between February and June, inclusive, over a two-year period, and taking the results as a whole, the Noah variety (highly susceptible) gave a lemon to pale yellow reaction, while Sirodot (susceptible), Mentana (highly susceptible), Vilmorin 23 (less so), Hope (less so), Piave (usually less so), Warren (not very susceptible), and Hindi 8 B (not very susceptible) gave, respectively, the following reactions, viz.: yellow, yellow to pale yellow, pale orange to rose-orange, pale rose to rose, pale orange to red, dark orange red to red, and red. Phenol red gives a yellow colour for acidity and red for alkalinity (P_H 6·8 and 7, respectively).

Foëx (E.). **Étude expérimentale des piétins du Blé au cours de la campagne 1934–1935.** [An experimental study of Wheat foot rots during the season 1934–1935.]—*Ann. Épiphyt.*, N.S., ii, 1, pp. 1–11, 2 figs., 1936.

The results of experimental infection of wheat with *Cercosporella herpotrichoides* [*R.A.M.*, xiv, p. 502; xv, p. 566] and *Ophiobolus graminis* [ibid., xv, p. 639] showed that active development of the former took place from October to April (inoculations on the 15th January 1935 giving 100 per cent. infection, those in mid-February, March, and April only slight infections, and that on 15th May having no effect on yield), whereas that of the latter was from early spring until harvest-time. Both affected 100 per cent. of the stools and tillers. The former reduced the total weight by 47 per cent., and the latter by 37 per cent., but the whiteheads caused by *O. graminis* reduced the weight of the ears and grain to a greater extent than *C. herpotrichoides*.

Wheat seed was treated with formalin, neutral Bordeaux mixture plus casein, cupric chloride, or neutral ortho-oxyquinoline sulphate, and then inoculated with *C. herpotrichoides* or *O. graminis*, but none of the treatments gave adequate control of foot rot. Neither fungus appears to be seed-borne, and where a slightly beneficial effect did accrue from any treatment it was due, apparently, more to a protection afforded to the seedlings against attacks from parasites in the soil than to seed disinfection. Spraying against *C. herpotrichoides* with sulphuric acid (12 l. at 65° Baumé per 100 l. water) on 1st January, 1st February, 1st March, 1st April, and 1st May in all cases reduced the yield of the uninoculated controls and gave a beneficial effect on the infected plants only when applied in May, when infection was very slight.

[A condensed version of this paper appears in *C.R. Acad. Agric. Fr.*, xxii, 4, pp. 140–147, 1936.]

GREČUŠNIKOV [GRETSCHUSHNIKOFF] (A. I.). **The physiology of the incubation period in rust infections.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., ii, 6, pp. 245–247, 1936.

The results of the experiments briefly discussed in this paper showed that in oat leaves heavily infected with *Puccinia coronifera* [*P. lolii*] photosynthesis is increased during the first few days of the incubation period, but soon falls and remains low even after the formation of the pustules [*R.A.M.*, xiv, pp. 300, 625]. Respiration, on the other hand, is at first sharply depressed, but abruptly increases with the onset of the spore formation by the rust, this increase coinciding with the appearance of urea in the host tissues [see next abstract]. In contrast with the result obtained by Schmidt [ibid., xii, p. 317] for *Uromyces betae* and *P. glumarum* no fat formation was detected after infection in the assimilatory cells of oats.

GREČUŠNIKOV [GRETSCHUSHNIKOFF] (A. I.). **Toxins of rust (Puccinia).** —*C.R. Acad. Sci. U.R.S.S.*, N.S., ii, 8, pp. 335–340, 1936.

Following a brief reference to a previous paper by A. A. Richter in collaboration with the author (*J. exper. Agron. S.-East* [Russian], vii, 1929) describing the isolation of toxins elaborated by rusts (*Puccinia* spp.), an account is given of a chemical investigation of the toxins of sunflower rust (*P. helianthi*), oat crown rust (*P. coronifera*) [*P. lolii*], and sow thistle [? *Cnicus arvensis*] rust (*P. suaveolens*) [*P. obtegens*: *R.A.M.*, viii, p. 791; xiv, p. 52]. The accumulation was demonstrated in aqueous toxin extracts (obtained from rusted leaf blades subjected to a preliminary desiccation at 80°) of ammonia and urea [see preceding abstract], confirming the view expressed by Chrzaszcz and Zakomorny (*Biochem. Z.*, cclxxv, 1–2, 1934) concerning the widespread capacity of fungi to form urea. Since no correlation was found between the severity of infection of the host and the amount of ammonia and urea in the extracts the author believes that a part of these compounds is eliminated by the metabolism of the host, and support for this hypothesis was found in the fact that saprophytic growth of the rust fungi was obtained during 12 days by removing the ammonia from the substratum by the addition of substances that adsorbed it. From the preponderance of ammonia and urea in the toxin extracts he concludes further that they are the active toxic principles. This view was supported by the results of experiments, in which various dilutions of 'natural' toxins and aqueous solutions of urea and ammonium salts were individually introduced by infiltration into healthy host leaves (by centrifuging the leaves for 6 minutes at 2,000 revolutions per minute). It was shown that ammonium salts introduced directly into the leaves depress photosynthesis, while urea intensifies it; at high concentrations the toxins, like ammonia, depressed photosynthesis, but at low concentrations they markedly intensified it; extracts from healthy leaves also intensified photosynthesis at all concentrations. Respiration was greatly intensified both by slightly diluted toxin extracts and by ammonia and urea. Finally, it was shown that the permeability of the host tissues is comparably increased by the rust toxins and by ammonia and urea.

WESTERN (J. H.). **The biology of Oat smuts. IV. The invasion of some susceptible and resistant Oat varieties, including Markton, by selected biological species of smut (Ustilago avenae (Pers.) Jens.) and Ustilago kolleri (Wille).**—*Ann. appl. Biol.*, xxiii, 2, pp. 245–263, 2 pl., 6 figs., 1936.

In continuation of this series of investigations on the biology of oat smut fungi [*R.A.M.*, xii, p. 758] the author gives a detailed account of histological studies of the invasion of oat seedlings inoculated with various forms of *Ustilago avenae* and *U. kolleri*, as a result of which he classifies the oat varieties in five grades according to the degree of resistance shown by them. In the first grade, comprising the most highly resistant forms (as exemplified by Markton to the L_{11} strain of *U. avenae* and C_1 strain of *U. kolleri*), all attempts at penetration by the smuts are frustrated by the development in the cell wall of a pad of material related to cellulose. In the second grade (Markton to *U. avenae* L_1 and L_2, and *U. kolleri* C_4), penetration is achieved, but the mycelium is confined to the superficial tissues only, and in seedlings 7 days old it is accompanied by marked necrosis in the surrounding host tissues, after which the mycelium rapidly degenerates and dies out. In grade three (Markton to *U. kolleri* C_2 and Potato oat (*Avena sativa*) to *U. avenae* L_{11}), intracellular mycelium is present in 7-day-old seedlings in the coleoptile and mesocotyl; most of it degenerates, but isolated traces of it may still be found in 21-day-old plants. In grade four (a selection of Welsh Strigosa to *U. avenae* L_1 and *U. kolleri* C_4), intracellular mycelium is abundant at seven days in the coleoptile and mesocotyl; at 14 days it is both intra- and intercellular and penetrates the deeper host tissues; at 21 days, remains of the mycelium are still present in the mesocotyl, but the growing point and meristems are not infected. In the fifth grade, the mycelium is very abundant at 21 days in the mesocotyl, and the growing point and meristems are heavily invaded. In oats, therefore, resistance to smut may be expressed as a reaction of the epidermal cell wall, a necrosis of the host cells, and a retarding effect on the growth of mycelium within the host.

Sheathing structures around the penetrating hyphae [loc. cit., p. 756] were found in Markton oat inoculated with *U. kolleri* forms C_1 and C_4; microchemical tests showed that they dissolved slowly in zinc chloride solution.

TAPKE (V. F.). **The influence of seed hulling on loose smut in naturally inoculated Oats.**—*Phytopathology*, xxvi, 6, pp. 588–596, 1936.

Hulling was shown by field observations in Virginia and Idaho not to afford a reliable basis for the determination of the relative importance of inoculum in the hulls and pericarp in the development of loose smut of oats (*Ustilago avenae*) [*R.A.M.*, vi, p. 411]. Within individual lots the percentages of reduction in smut in plants raised from hulled seed ranged from 2·1 to 90·2 per cent. in the three experimental localities, while in different lots grown under similar conditions wide variations in smut reduction from hulling also occurred. In general, relatively unfavourable conditions for the disease were more acutely reflected in plants from hulled seed than in those from non-hulled. The inconsistencies

in the amount of smut reduction from hulling indicate that this process involves other factors besides a decrease in the load of inoculum carried by the hulls. These organs may apparently serve as more or less effective buffers in protecting the inoculum in the pericarp from various soil influences inimical to infection. Hulled seed of all the ten lots used in the tests produced some diseased plants, showing that at least a portion of the loose smut resided in the caryopses.

Austin (W. W.) & Robertson (D. W.). **Inheritance of resistance to Ustilago levis (K. & S.) Magn. (covered smut) in a cross between Markton and Colorado 37 Oats.**—*J. Amer. Soc. Agron.*, xxviii, 6, pp. 467–471, 1936.

Seed from the F_1 progeny of hybrids between Markton (C.I. No. 2053) oats, resistant to covered smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, xv, p. 493], and Colorado 37 (C.I. No. 1640), susceptible to the disease, was threshed, dehulled, and inoculated with ground smutted panicles. In the F_2 the discrepancies were too great to permit of definite conclusions as to reaction to *U. kolleri*. The F_3 families segregated in the ratio of 9 healthy to 7 diseased, whence it was inferred that a two-factor difference for smut exists between the parents, Markton possessing the two dominant factors for resistance, while Colorado 37 had the recessive allelomorphs of these factors. Certain very promising, highly resistant lines are being continued in the hope of securing some prolific, smut-resistant commercial strains.

Davis (G. N.). **Some of the factors influencing the infection and pathogenicity of Ustilago zeae (Beckm.) Unger on Zea mays L.**—*Res. Bull. Ia agric. Exp. Sta.* 199, pp. 248–278, 8 figs., 4 graphs, 1936.

In this amplified account of his studies on maize smut (*Ustilago zeae*) [*R.A.M.*, xiv, p. 750; xv, p. 572; and next abstract] the author states that a survey conducted in several fields near Ames, Iowa, at the end of the seasons of 1930 to 1934 inclusive, showed 10·6, 8·9, 13·9, 5·5, and 18·3 per cent. of the plants affected by visible smut galls. When the leaf sheaths were stripped from 1,985 plants exposed to natural and artificial infection in 1934 many small smut galls, aggregating 39·3 per cent. of the total infection, were found at the nodes, showing that smut readings based on exposed galls alone are much too low. The exposed symptoms comprise irregular, yellow or reddish stripes or blotches, brownish lesions, and galls, and the concealed symptoms small, nodal galls and minute pustules of chlamydospores in leaves of axillary buds.

Stimulation of axillary bud development by inhibiting pollination by bagging the shoots just before silking resulted in increased percentages of smutted plants, from 11·6 to 32·4 and 11·8 to 21·8 in artificially inoculated plants in 1932 and 1933, respectively, and from 8·3 to 28·3 and 6·2 to 13·9 in naturally infected plants in the same years. The percentage of nodal smut infection increased with lateness in planting, data for two years showing an average of 12 per cent. on May 15th plantings and 40 per cent. on the June 4th plantings. Rate of planting was found to affect smut infection, as indicated by nodal galls, the percentage increasing both ways from the 2–3 rates of planting, plants growing 1, 3, and 5 per hill showing 40·8, 22·5, and 32·4 per cent. infec-

tion, respectively, in 1931; 20·4, 13·5, and 21·6 in 1932; 9·0, 4·3, 5·9 in 1933, and 22·8, 14·6, and 18·5 in 1934.

Walter (J. M.). **Factors affecting the development of Corn smut, Ustilago zeae (Beckm.) Unger.**—*Tech. Bull. Minn. agric. Exp. Sta.* 111, 67 pp., 3 figs., 1 diag., 1936.

In studies carried out at the University Farm, St. Paul, Minnesota in 1930–33 on maize smut (*Ustilago zeae*) [see preceding abstract] it was found that mutilation by slashing and by detasseling (topping) markedly increased the severity of smut only when practised on plants at an intermediate stage of growth, the response evidently depending upon host genotype.

No increase in infection resulted from the application of large amounts of inoculum to parts of the plant reached by meteoric water, whence it is concluded that there is usually an abundance of inoculum and that its effectiveness is influenced to a considerable extent by environmental factors. Injection of sterilized water into the spirals of 12 to 20 inch plants greatly increased total smut infection (but not nodal-bud smut on the Rustler variety), especially in the latter half of the season, apparently by making contact between inoculated meteoric water of the upper leaf spiral and the young susceptible tissues lower down. Rolling the leaf spirals between the hands during or following rain in imitation of the spiral loosening effect of twisting in the wind effectually increased smut on plants between the 12 in. and early boot stages.

Direct infection through the young husks caused ear smut in some lines but does not appear to be very common. Smut was generally more destructive to late than to early plantings. On low, well-watered land the Rustler variety developed less smut than that on land deficient in moisture but Northwestern Dent did not respond in the same manner. The application of fertilizers did not significantly affect smut attack during the four seasons of the experiments. Cultivation practices affected the vigour of the plants in 1931 but not the total smut incidence; usually the prevalence of nodal-bud smut was inversely related to vigour in both Rustler and Northwestern Dent varieties. Sustained rapid development of maize plants to full stalk size frequently favours escape from, or resistance to, smut and development of large smut galls later in the season appears to be dependent upon lateral meristem activity.

Burk (E. F.), Cross (C. B.), & Hixson (E.). **Variety tests of Sweet Corn and its resistance to Corn earworm and smut injury.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 502–504, 1936.

In a test at the Oklahoma Agricultural Experiment Station on the reaction to maize smut (*Ustilago zeae*) [see preceding abstracts] of 39 commercial varieties and strains of sweet corn, the following six proved to be the most resistant: Golden Giant (1·6 per cent. infection), Ideal or Big Adams (1·9), Norfolk Market (2·1), Top-Cross Bantam (2·7), Trucker's Favourite (2·9), and Country Gentleman (3·0). The disease was most prevalent in the stands raised from southern-grown seed and there was a tendency for heavy smut infection to be associated with poor stands, which may indicate that smut infection destroys many young plants.

FERNANDO (M.). **Mottle leaf of Citrus: its incidence and control.**—*Trop. Agriculturist*, lxxxvi, 6, pp. 332–334, 1 col. pl., 1936.

Mottle leaf is stated to occur on a variety of soil types in Ceylon affecting chiefly mandarin oranges [*Citrus nobilis*], though it has also been observed on sweet orange, grapefruit, and West Indian lime [*R.A.M.*, xv, p. 576]. Satisfactory control was obtained by spraying with zinc sulphate and lime (10–5–100) plus ½ lb. solol or 4 oz. actin as a spreader.

PITTMAN (H. A.) & OWEN (R. C.). **Anthracnose and mottle leaf of Citrus in Western Australia.**—*J. Dep. Agric. W. Aust.*, xiii, 2, pp. 137–142, 2 figs., 1936.

Citrus anthracnose (*Colletotrichum gloeosporioides*) [*R.A.M.*, xv, p. 496] has gradually increased in importance in Western Australia during recent years, and observations suggest that this may be correlated with the increasing development of mottle leaf [see preceding and next abstracts]. Experiments are described in which the attempt was made to overcome the mottle leaf condition associated with die-back by spraying with zinc sulphate. Six badly mottled Valencia and navel orange trees sprayed on 27th October, 1935, with a 1 per cent. solution showed a definite improvement over the unsprayed controls after six weeks. At the same time, another tree was sprayed with the same solution on one side only. Six weeks later the new growth on this side was free from mottling, whereas the unsprayed part was markedly chlorotic, though the beneficial effect had spread to it. In further experiments, trees sprayed once with 1 per cent. solution showed marked improvement, others sprayed twice showed no improvement over those sprayed once, and may have been slightly checked, while yet others, sprayed with ½ per cent. solution, benefited considerably. Pending further experiments, no definite recommendations are made for the spraying of commercial orchards, but for experimental purposes the author suggests that growers should use either zinc lime mixture (5–2½–50) or zinc Bordeaux (2½–2½–5–50).

PARKER (E. R.). **Experiments on the treatment of mottle-leaf of Citrus trees. II.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 82–86, 1936.

In further experiments on the control of mottle leaf of citrus in California by zinc compounds [*R.A.M.*, xiv, p. 506; and preceding abstracts], good results were again obtained on Valencia oranges by spraying with zinc sulphate and lime, applied at a strength of 10–5–100 to severely diseased and at that of 5–2½–100 to mildly affected trees. Complete coverage of the trees is not essential and, in general, the curative effects of sprays of 4·2 or 10 galls. per tree are thorough and durable. Improved adhesion was secured by the addition to the mixture of powdered blood albumin (4 oz. per 100 galls.). Promising results have also been given by zinc oxide (3 or 1½ lb. per 100 galls. according to the severity of the symptoms) and (in preliminary tests) by a number of other zinc compounds, but a longer period is necessary before a final judgment can be formed on the efficacy of the latter.

BATES (G. R.). **I. Studies on the infection of Citrus fruits. i. Some methods of infection by the green mould—Penicillium digitatum Sacc.**—*Publ. Brit. S. Afr. Co., Mazoe Citrus exp. Sta.* 4b, pp. 88–101, 1936.

In continuation of his studies on the infection of citrus fruits by *Penicillium digitatum* [*R.A.M.*, xiii, p. 228; xv, p. 495] the author has found that dry spore inoculations through needle punctures are not successful unless the wounds reach the inner pulp or one or more oil vesicles are ruptured, the flavedo and albedo being entirely resistant to infection under these conditions. Inoculations with aqueous spore suspensions through wounds between the oil vesicles gave positive results, the percentage of infection increasing with the depth of the wounds, being low in very shallow wounds and very high in those extending to the albedo. Resistance to infection through shallow wounds was completely broken down by using as inoculum a spore suspension either in orange juice or in the essential oil of the rind, while 4 per cent. fructose promoted infection better than 5 per cent. sucrose or distilled water alone. Scale-infested oranges were easily infected when inoculated with spores suspended in orange juice. Sound oranges were also infected through the rind by using a similar inoculum, success depending apparently on the quantity of inoculum available. Preliminary inoculation experiments with aqueous suspensions of spores indicated that infection of oranges may take place through the stem end in the absence of wounding, but the point of entry was not determined.

BATES (G. R.). **Storage tests with Rhodesian Oranges during 1934.**—*Publ. Brit. S. Afr. Co., Mazoe Citrus exp. Sta.* 4 b, pp. 103–131, 5 pl., 1936.

In the preliminary tests reported in this paper Jaffa, Mediterranean Sweet, and Valencia Late oranges were stored at 36° and 40° F.

A physiological breakdown or pitting [*R.A.M.*, xv, p. 647] was observed on the Jaffa and Valencia Late varieties, and to which Washington Navels were also found susceptible. The earliest symptom is usually a small brown discoloration of the tissues surrounding the oil vesicles, a number of small spots being scattered over the fruit or localized in one area. The markings increase in size and coalesce to form large, irregular lesions, which darken to various shades of brown. As the surrounding tissues dry out the oil vesicles collapse and appear as minute cavities. With long storage the lesions extend to the spongy albedo.

Pitting was more severe at 36° than at 40° and more prevalent among late-season than early-season fruit. Most of the pitting developed during the first three or four weeks of storage. Ethylene-treated fruit stored soon after colouring showed much more pitting than wilted fruit but this was remedied by giving the former an extra seven days' wilt before storage. A considerable degree of control was also obtained by wrapping the fruit in paper containing 8 per cent. mineral oil. The disorder is thought to be closely associated with respiratory activity.

Wastage was approximately the same at the two storage tempera-

tures used. Losses from moulds during the first four weeks was negligible and due solely to *Penicillium italicum* and *P. digitatum*. Stem-end and core rots did not develop appreciably till after 8 weeks, when isolations showed that *Colletotrichum gloeosporioides* [see above, p. 714] generally attacks the skin tissues and *Alternaria citri* the core and pulp. Wilted oranges showed less wastage than the ethylene treated, and generally speaking the longer the fruit was held in cold storage the more rapidly it deteriorated on removal. The ineffectiveness of surface sterilization in the control of *C. gloeosporioides* is thought possibly to be due to dormant infection which takes place when the fruit is immature. In experiments with Valencia oranges, two distinct types of stem-end browning were observed, termed depressed and smooth (or superficial browning), respectively. *A. citri* was commonly isolated from oranges with the former symptoms and in most cases the decay found was central rot. In smooth stem-end browning the injury is superficial and *C. gloeosporioides* was almost invariably isolated from the underlying skin tissues. In two tests wilted fruit showed 26 and 25 per cent. stem-end browning against 32 and 33 per cent. for the ethylene coloured.

CARRERA (C.). **Informe de las observaciones y experimentaciones efectuadas sobre una nueva enfermedad aparecida en los Citrus de Bella Vista (Corrientes).** [Report on the observations and experiments carried out on a new Citrus disease that has developed at Bella Vista (Corrientes).]—*Bol. Minist. Agric., B. Aires*, xxxvii, 1–4, pp. 15–36, 2 col. pl., 5 figs., 1935. [Received September, 1936.]

A fully tabulated account is given of the writer's studies on a new disease causing heavy damage in the citrus (mostly orange grafted on *Citrus aurantium*) groves of Bella Vista (Corrientes, Argentine). The trouble is characterized by yellowing of the leaves, premature defoliation and shedding of the flowers and fruit, and discoloration of the rootlets, the brittle cortex of which is readily detachable, revealing a reddish or bluish central cylinder. The disturbance appears sporadically, sometimes simultaneously, in different parts of a grove, mostly on 12- to 15-year-old trees in low-lying, poorly fertilized sites, on impermeable sandy soil with an acid reaction.

Negative results were given by inoculation experiments on *C. aurantium* with the three species of *Fusarium* isolated from the diseased material, namely, *F. oxysporum* var. *aurantiacum* [*R.A.M.*, xv, p. 701], *F. solani* var. *martii* [ibid., xv, p. 643], and *F. solani* [ibid., xiii, p. 631], and their part in the etiology of the disease is considered to be purely secondary, the primary factors being nutritional and physiological. Control measures should include the use of green, and stable manure, the application to the soil of calcium carbonate and appropriate synthetic fertilizers, and treatment of the trees with 1 per cent. Bordeaux mixture or other standard fungicide.

BAKER (R. E. D.). **Root disease of the Lime in Montserrat.**—*Trop. Agriculture, Trin.*, xiii, 6, pp. 147–148, 1936.

From dead branches and roots of lime trees affected with root disease, associated with attacks of *Diaprepes* larvae in Montserrat, the author isolated *Botryodiplodia theobromae*, *Phomopsis* [*Diaporthe*] *citri*,

and a *Fusarium* sp., the last-named fairly constantly, but these are not considered to be primary parasites. *Diplodia* die-back may be distinguished from root disease, which exhibits die-back symptoms, by the facts that in the former the branches are generally black, the disease starts from the top or windward side of the tree and is limited to the upper parts. *Diplodia* is a common saprophyte and may occur on dead parts of a tree attacked by *Diaprepes* while possibly *Fusarium* sp. and *Sphaerostilbe repens* [*R.A.M.*, xv, p. 574] may be weakly parasitic following damage to the roots by the larvae. Red root disease (*S. repens*) and withertip (*Gloeosporium limetticolum*) have so far caused no serious losses in the Island probably owing to the dry climate.

TURNER (F. A. S.). **Shell bark (decorticosis) of Lemon trees.**—*Fmg S. Afr.*, xi, 123, p. 258, 1 fig., 1936.

A popular note is given on shell bark or decorticosis of lemons (*Phomopsis* [*Diaporthe*] *citri*) [*R.A.M.*, xv, p. 496], which is stated to occur occasionally in South Africa on the Eureka and Villa Franca varieties, mature plants only being affected.

HENDRICKX (F. L.). **Liste annotée des organismes végétaux signalés sur le genre Coffea. En annexe : maladies physiologiques ou d'origine mal connue.** [An annotated list of plant organisms recorded on the genus *Coffea*. Appendix: diseases of physiological or imperfectly known origin.]—*Ann. Gembl.*, *1935*, pp. 407–465, [1935]; *1936*, pp. 20–25, 1936.

A list is given of bacterial, fungal, physiological, and other diseases recorded to date on the genus *Coffea*, arranged according to families under the scientific names, together with the common names, other hosts affected, nature of the symptoms, and geographical distribution of the organism or condition; this is followed by a bibliography of 158 titles.

GOKHALE (V. P.). **Preliminary observations on small-leaf disease in Cotton.**—*Indian J. agric. Sci.*, vi, 2, pp. 475–480, 1936.

A survey of the cotton growing tracts of the Bombay Presidency in 1933–4 showed small-leaf disease [? stenosis: *R.A.M.*, xiv, p. 561; xv, p. 648] of cotton to be widespread though it was absent from the southern part of the Surat district and from Khandesh. The disease varies in intensity from year to year but ranged from 5 to 15 per cent. in South Maratha in 1932–3. In the Kaira district it is serious in the first and second ratoons, and the damage to the latter may be as high as 35 per cent. Only herbaceum types were affected and among these none appeared more resistant than the rest. The symptoms of the disease are described in detail. Attempts to transmit the disease by sap, by grafting, and by insects were unsuccessful.

DASTUR (R. H.). **A preliminary note on Cotton failure in the Punjab and some abnormalities in the plant.**—*Indian J. agric. Sci.*, vi, 2, pp. 377–395, 3 pl., 1936.

A disorder of cotton known as red leaf disease [*R.A.M.*, xii, p. 567; xiii, p. 698] is responsible for periodic partial failures of the American

cotton crop in the Punjab. The symptoms are an early reddening of the leaves, poor opening of the bolls with immature seed and low quality lint, and in extreme cases the dwarfing of the plant. Nutrition was suspected as the cause of the trouble, and microchemical studies showed that disintegration of the chloroplasts begins in apparently healthy leaves and is followed by an accumulation of starch in the mesophyll cells. Elongation of the palisade and mesophyll cells results in the crumpling, curling, and thickening of the leaves. Later the cells become filled with yellowish deposits of the nature of tannins, fats, and proteins, while anthocyanins and anthoxanthins form in the epidermis, giving a reddish colour to the leaves.

Small, yellow, granular masses appear in the cortex of the roots, and in the phloem and other conducting parenchyma, reacting with starch to form complex deposits of proteins, fats, and tannins. Similar deposits are also found in the stem, sometimes extending even to the upper parts. These formations occur in more than 50 strains of cotton but do not lead to external manifestations except in the American types and the use of the term red leaf for this disease is therefore deprecated.

Isolations from the leaf, stem, root, and embryo of affected plants have yielded a rod-shaped bacterium with peritrichiate flagella. It is tentatively suggested that this organism is responsible for the destruction of the chloroplasts and the consequent inhibition of metabolic activity, leading to under-nourishment and premature opening of the bolls.

Dounin (M. S.) & Poner (V. M.). Озониоз. (Техасская корневая гниль и ее аналоги). [Ozoniosis (Texas root rot and its analogues).]—328 pp., 79 figs., Госуд. Издат. колх.-совх. Литер. „Сельхозгиз" [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Leningrad, 1936. [English summary.]

This is a very complete compilation from the relevant literature [255 titles of which are cited in the appended bibliography] of information on the Texas cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xv, p. 648], supplemented by some experimental, chiefly confirmatory work by the authors with material imported from the United States. Although the presence of the fungus has been reported several times in the southern and south-eastern districts of the U.S.S.R., careful researches there during 1934 failed to confirm these reports [ibid., xv, p. 422], but as the weather conditions in that year were not favourable to the disease, the respective areas are being still kept under strict observation. In the meantime, in view of the potentialities of *P. omnivorum* for harm, since it is known to be pathogenic to about 900 species of cultivated and wild plants, its introduction into the U.S.S.R. from abroad should be guarded against by strict quarantine measures, and all imported susceptible perennial hosts should be grown for at least two years in experimental stations. Control measures, as applied in the United States, are discussed in detail, and further studies on the biology of the organism are advocated, so that adequate measures may be taken to deal immediately with any infection foci that might be found in the U.S.S.R.

GUILLIERMOND (A.). **L'Eremothecium ashbyii, nouveau champignon parasite des capsules du Cotonnier.** [*Eremothecium ashbyii*, a new fungus parasitic on Cotton bolls.]—*Rev. Mycologie*, N.S., i, 3, pp. 115–156, 2 pl. (1 col.), 25 figs., 1936.

An expanded account is given of the author's study of the fungus isolated from cotton bolls by Massey in the Sudan and referred to [without a Latin diagnosis] as *Eremothecium ashbyii* [*R.A.M.*, xiv, p. 693].

STEYAERT (R. L.). **Le port et la pathologie du Cotonnier. Influence des facteurs météorologiques.** [The habit and pathology of the Cotton plant. The influence of meteorological factors.]—*Publ. Inst. nat. Étud. agron. Congo Belge*, Sér. sci., 9, 32 pp., 1 fig., 23 graphs., 1936.

A fully tabulated account is given of studies conducted in the Belgian Congo in 1934–5 of the effect of different climatic conditions on the development of the cotton plant. The data obtained showed that in the area concerned leaf formation, flowering, and boll development [*R.A.M.*, xv, p. 147] depends particularly on atmospheric temperature, the correlation coefficients relative to this factor being persistently negative and significant, and therefore indicating that in the locality where the investigation was conducted the plants were growing in too high a temperature. Of the humidity coefficients the most important were daily rainfall and relative humidity. *Bacterium malvacearum* is practically non-existent locally [ibid., xiv, p. 223], but internal boll rots merit serious attention, and owing to the losses sustained count as the most important of all the fungal and bacterial affections of cotton; three forms of these rots appear to be present in the Belgian Congo, viz. stigmatomycoses due chiefly to *Nematospora* [*coryli* and *N. gossypii*; ibid., xiv, p. 507; xv, p. 437], bacterial boll rots and an undetermined red rot [loc. cit.], of which those of fungal origin are the most serious. No marked differences in resistance to internal boll rots were noted in four varieties tested. Boll rots externally visible include anthracnose (*Glomerella gossypii*) [ibid., xv, p. 149], fusariosis caused by several as yet undetermined species of *Fusarium* [ibid., xiv, p. 224], and an affection of the carpel due to *Diplodia gossypina* [ibid., xv, p. 215]. A more judiciously chosen sowing date (6th July, locally) will, it is thought, greatly reduce the losses from internal boll rots of fungal origin [ibid., xiv, p. 507]. It is concluded that a survey of all the data obtained demonstrates conclusively that climatic factors are of the greatest importance in cotton growing.

CHARLES (VERA K.). **The synonymy of Botrytis rileyi Farlow.**—*Mycologia*, xxviii, 4, pp. 397–398, 1936.

The fungus received by Petch on *Anticarsia gemmatilis* from Florida and identified by him as *Spicaria prasina* [*R.A.M.*, v, p. 97; vi, p. 229] has been determined by mycologists in the United States as *Botrytis rileyi* [ibid., x, p. 188]. In view of the close similarity of *B. rileyi* with the genus *Spicaria* and the priority of the specific name the author renames the species *S. rileyi* (Farl.) n. comb.

Drechsler (C.). **A new species of Stylopage preying on nematodes.**—*Mycologia*, xxviii, 3, pp. 241–246, 1 fig., 1936.

Latin and English diagnoses are given of *Stylopage leiohypha* sp. nov., a parasite of nematodes (*Rhabditis*, *Cephalobus*, and *Acrobeles* spp.) in Florida celery fields. The fungus differs from *S. hadra* [*R.A.M.*, xiv, p. 508] in its more slender hyphae (2 to 3 μ in width), narrower conidiophores (125 to 300 by 2·5 to 3·5 μ), and smaller conidia (20 to 35 by 7 to 18 μ, average 29·3 by 12·8 μ). Some possible taxonomic relationships of the Zoopagaceae [see next abstract] are briefly discussed.

Drechsler (C.). **New conidial Phycomycetes destructive to terricolous amoebae.**—*Mycologia*, xxviii, 4, pp. 363–389, 7 figs., 1936.

Detailed descriptions with Latin and English diagnoses are given of the following new species of Zoopagaceae predacious on amoebae in the United States: *Endocochlus brachysporus*, *E. gigas*, *Stylopage rhabdospora*, *Zoopage atractospora*, and *Z. cladosperma*, all isolated from leaf mould; *Acaulopage cercospora* from muck soil; and *Z. nematospora* from decaying plant materials.

Karling (J. S.). **A new predacious fungus.**—*Mycologia*, xxviii, 4, pp. 307–320, 5 figs., 1936.

A detailed description is given of *Zoophagus tentaclum* n. sp. [with a diagnosis in English] found growing loosely epiphytic on filaments of *Nitella flexilis* in New Jersey as a predacious parasite of species of *Monostyla* and *Distyla*.

Kharasch (M. S.), King (H.), Stoll (A.), & Thompson (M. R.). **The new ergot alkaloid.**—*Nature, Lond.*, cxxxvii, 3462, p. 403, 1936.

As a result of the exchange and comparison of the four ergot [*Claviceps purpurea*] alkaloid specimens isolated concurrently and independently in three countries in 1935 [*R.A.M.*, xv, p. 223] the writers (of whom H. King acted in place of the late H. W. Dudley) are agreed that the melting-points, mixed melting-points, and optical activities of the several samples point to their identity. The choice of the recognized name for the new alkaloid—ergometrine, ergotocin, ergobasine, or ergostetrine—is left to the world of science.

Moore (M.). **The organisms of chromomycosis of North and South America.**—*Science*, N.S., lxxxiii, 2164, pp. 603–604, 1936.

As a result of studies conducted in collaboration with Almeida in Brazil the writer ascertained various important facts bearing on the classification of the agents of chromoblastomycosis. In the first place, as already shown by Mackinnon, *Phialophora verrucosa* is not confined to North America [*R.A.M.*, xv, pp. 220, 503], and a fungus has been recently described from Buenos Aires with the characters of *Phialophora*. Secondly, a careful examination of various fungi known as *Acrotheca* revealed characters, such as branching and conidial formation in heads, which are definitely not those of the genus but approximate to *Botrytis*. Other characters, however, are suggestive rather of the Dematiaceae than of the Mucedinaceae, and a new genus, *Botrytoides*

Moore & Almeida, is therefore proposed to replace *Acrotheca* and *Trichosporium* for the agent of chromoblastomycosis. Thirdly, a *Hormodendrum* [ibid., xiv, p. 509; xv, p. 220] has been isolated from authentic cases of the disease, and finally, an organism recently isolated from a Brazilian patient partakes at various stages of the nature of all the above-mentioned genera. The name proposed for this complex new organism, which apparently connects *Botrytoides*, *Phialophora*, and *Hormodendrum* in a close relationship, is *Phialoconidiophora guggenheimia* Moore & Almeida [without a Latin diagnosis].

Conant (N. F.). **Studies in the genus Microsporum. I. Cultural studies. II. Biometric studies.**—*Arch. Derm. Syph., Chicago*, xxxiii, 4, pp. 665–683; xxiv, 1, pp. 79–89, 6 figs., 4 graphs, 1936.

Eighteen strains of the following species of *Microsporon* from different sources were studied on various standard media in the hope of finding a reliable basis for specific separation [cf. *R.A.M.*, xv, p. 294]: *M. fulvum* [ibid., xv, p. 440], *M. gypseum* nov. comb., *M. lanosum*, *M. felineum* [ibid., xv, p. 92], *M. equinum* [ibid., xiv, p. 581], *M. simiae* n. sp., *M. pseudosolanosum* n. sp., *M. aurantiacum* n. sp., *M. obesum* n. sp., and *M. audouini*.

The strains showed a great diversity of reaction, involving not only macroscopic but also microscopic changes [which are described in great detail], to the various media and to any given substratum, a fact that is considered to invalidate the use of gross cultural appearances for diagnostic purposes. Spore forms were either produced irregularly or not at all in agar media, whereas on polished rice grains (1 part to 3 of water in 125 c.c. flasks) [cf. ibid., ix, p. 781 *et passim*] these organs developed in profusion.

On the basis of biometric studies on the macroconidia of the above-mentioned species of *Microsporon* on a polished rice medium, the claim to specific rank was judged to be well founded in the cases of *M. fulvum* (average spore length 38 to 40 μ), *M. gypseum* (44 to 48 μ), *M. obesum* (48 to 56 μ), *M. simiae* (54 to 58 μ), *M. equinum* (62 to 66 μ), and *M. lanosum* (70 to 76 μ). The somewhat overlapping curves for *M. pseudolanosum* and *M. aurantiacum* (64 to 68 and 64 to 72 μ, respectively) are less convincing from the standpoint of specific differentiation, but the rusty to orange conidia of the latter are evidently distinct from the light buff organs of the former, while the conidial production in clusters in *M. equinum* readily serves to separate this species from the looser type of spore formation in *M. pseudolanosum*.

Catanei (A.). **Premières recherches sur les teignes du chien en Algérie.** [Preliminary studies on canine ringworms in Algeria.]—*Arch. Inst. Pasteur Algér.*, xiv, 2, pp. 104–108, 2 pl., 1936.

Clinical and morphological details are given of the three species of fungi isolated from canine ringworms in Algeria, viz., *Microsporon canis* Bodin 1902 (this name being preferred on grounds of priority to *M. felineum* (*M. lanosum*) [see preceding abstract]), *Ctenomyces mentagrophytes* (*Trichophyton asteroides*) [*T. mentagrophytes*], and *Achorion schoenleini*.

Mazzanti (C.). **Dermatite verrucosa micosica americana (malattia di Gilchrist).** [American mycotic verrucose dermatitis (Gilchrist's disease).]—*G. ital. Derm. Sif.*, lxxvii, 3, pp. 363–378, 4 pl., 1936.

Full clinical details are given of a case of verrucose dermatitis contracted in the United States and attributed on the authority of Prof. P. Redaelli to *Gilchristia* [*Endomyces*] *dermatitidis* [*R.A.M.*, xv, p. 295]. Previous records of the disease are summarized and the systematic position of the causal organism discussed.

James (R. F.). **Mold and bacteria killed by new lamp.**—*Food Industr., 1936*, 6, pp. 295–297, 5 figs., 1936.

Details are given of the highly successful results obtained during the last nine years in the control of mould and bacterial spoilage in meat and bakery products [*R.A.M.*, xv, pp. 454, 574] by exposure to the 'sterilamp', a gaseous-conductor tube generating radiant energy of which 90 per cent. is in a strongly germicidal region of the spectrum. It is made in lengths of 10, 20, or 30 in. and only 7 watts of electrical energy are required for the maximum dimension. The lamp operates at a temperature only 4 or 5 degrees above room temperature.

Control of odours and molds by ozone and ionized oxygen.—*Food Industr., 1936*, 6, p. 307, 1936.

Information is stated to be available to the effect that ozone at the rate of 1 or 2 parts per million prevents the development of moulds in eggs [*R.A.M.*, xiv, p. 237] for periods up to 15 months under well-controlled temperature and humidity conditions, while at the extremely high concentration of 5 parts per million it is reported to have actually eliminated existing mould growth on eggs. Ozone has also been used on a small scale to combat moulds of meat [see preceding abstract] and given satisfactory results in the case of lean material; it is, however, liable to affect the flavour of fat. Ionized oxygen has also been successfully used for similar purposes.

White (E. A.), Massey (L. M.), & Blauvelt (W. E.). **Garden Roses.**—*Ext. Bull. Cornell agric. Exp. Sta.* 342, 53 pp., 21 figs., 1936.

In the section of this bulletin dealing with diseases of garden roses, by L. M. Massey (pp. 33–44) notes are given on the symptoms, causal organism and its life-history, and control of black spot (*Diplocarpon rosae* [*R.A.M.*, xv, p. 653], powdery mildew (*Sphaerotheca pannosa*) [ibid., xv, p. 298], brown canker (*Cryptosporella* [*Diaporthe*] *umbrina*) [ibid., xiv, p. 498], and stem canker (*Coniothyrium fuckelii*) [*Leptosphaeria coniothyrium*: ibid., xv, p. 653].

Massey (L. M.) & Lyle (E. W.). **Control of black spot on Roses studied at Cornell.**—*Flor. Rev.*, pp. 19–20, March 5, 1936. [Received September, 1936.]

In this paper the preliminary results are given of an investigation into the control of rose black spot (*Diplocarpon rosae*) [see preceding abstract] under glasshouse conditions carried out at Cornell University. Three years' investigation by the senior author of the temperature and

moisture relations of the fungus demonstrated that little hope can be held out of preventing infection by controlling temperature, and at the same time growing good roses. Varying the humidity, however, gave more promising results. Water as such, or a humidity high enough to indicate the probability of condensation on the foliage, was ascertained to be necessary for spore germination and infection. For infection to take place the plants had to remain continuously wet for over six hours, the period required depending on the temperature. The spores were found to be largely disseminated by the splashing of water from plant to plant and leaf to leaf. The importance of greatly reducing, or if possible eliminating, syringing then became apparent, and experimental evidence was obtained that control of red spider [*Tetranychus telarius*], which became necessary when syringing was discontinued, could be secured by appropriate applications of selocide. The elimination of syringing combined with ordinarily good glasshouse practices effectively held black spot in check, the method being uniformly successful in numerous glasshouses. Even where the disease was threatening to assume epidemic proportions, infection was suppressed when selocide was substituted for syringing, infection being reduced by as much as 99·8 per cent. in 20 weeks. The elimination of syringing also greatly reduced the expense and labour involved in tying up roses of the Talisman type which develop crooked stems after being sprayed unless straightened up. Plants kept free from black spot and red spider held their leaves nearly down to the ground in contrast with 'long-legged' diseased plants. [This paper also appears in *Flor. Exch.*, February 29, 1936.]

Massey (L. M.). **The 1935 disease-control campaign.**—*Amer. Rose Annu., 1936*, pp. 110–116, 1936.

The results obtained during 1935 in the control of black spot (*Diplocarpon rosae*) [see preceding abstracts], mildew (*Sphaerotheca pannosa*), and other diseases of the rose by 64 growers, widely scattered in the United States and co-operating in a disease control campaign, are tabulated and analysed. Of the materials used sulphur-lead arsenate dust (90–10) was the most popular (30 growers), followed by tri-ogen (18), and the average number of applications was 25 and 23, respectively. Nineteen growers reported satisfactory control of black spot with the former product and 8 by the latter; and 19 out of 20, and 13 out of 16 satisfactory control of mildew by the two products, respectively. Six growers reported burning from the sulphur-lead dust and 5 from the tri-ogen. Black spot was the most troublesome disease to 33 growers, mildew to 6, five other diseases to one grower each.

Lacey (Margaret S.). **Studies in bacteriosis. XXII. I. The isolation of a bacterium associated with 'fasciation' of Sweet Peas, 'cauliflower' Strawberry plants and 'leafy gall' of various plants.**—*Ann. appl. Biol.*, xxiii, 2, pp. 302–310, 2 pl., 1936.

The author states that after repeated failures she finally succeeded in isolating a very slow-growing bacterium from fasciated sweet peas [*R.A.M.*, xiv, p. 365], which on inoculation through wounded or unwounded surfaces invariably produced severe fasciation in germinating sweet pea seeds, and which was reisolated with its pathogenicity fully

retained from the latter. 'Leafy galls', characterized by the development of very short, hypertrophied shoots at the base of the plant or cutting, spreading horizontally until a large gall-like mass is produced, the older parts of which rot away but are later replaced by further growth, occur on chrysanthemum [ibid., xiv, p. 635], carnation, and *Schizanthus retusus*. Isolations from these and from 'cauliflower' strawberry plants [ibid., xi, p. 380] yielded a very similar bacterium, which also on inoculation caused severe fasciation of sweet pea seedlings. Marked fasciation also occurred when the seedlings were grown in inoculated sand cultures. The inoculation experiments gave clear evidence that the organism was most pathogenic to the seedlings just after germination; after 17 days the seedlings only became infected through wounds, and only slight fasciation developed on 24-day-old seedlings. The bacterium (which is being studied further) is a Gram-positive, non-motile, and non-acid-fast rod of very variable length, sometimes filamentous in old cultures, and frequently found in groups forming Y, W, or star-shapes, morphologically suggestive of *Bacillus radicicola* or *Bacterium tumefaciens*. It grows slowly on bouillon agar, especially at first, forming round, raised colonies, with entire margin, becoming dense, rather dry, sometimes papillate, sometimes with a narrow flat border, white at first, slowly becoming pinkish-yellow and finally deep yellow, is markedly aerobic, makes no growth at 37° C., with an optimum temperature of 25°, and a thermal death point at about 50°, does not liquefy gelatine or reduce nitrates, and has no diastatic action on starch. A slight variation was observed between the strains isolated from the different hosts in their growth on synthetic sugar media and in their action on litmus milk, but all are considered to belong to one species which has not yet been identified with any other previously known.

Longley (L. E.). **Flower color in 'broken' or mosaic Tulips.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 647–677, 1936.

Out of 80 tulip varieties inoculated at the Minnesota Agricultural Experiment Station by rubbing the leaves with material from mosaic or 'broken' foliage [*R.A.M.*, xv, p. 156], 39 (including *T*[*ulipa*] *elegans*) contracted definite infection in the Early, Cottage, Darwin, Breeder, and Lily Flowering groups, and are listed according to their colour.

Edwards (E. T.). **The witches' broom disease of Lucerne.**—*Sci. Bull. Dep. Agric. N.S.W.* 42, 31 pp., 15 figs., 1936.

This is an amplified account of the writers' studies on the witches' broom disease of lucerne in New South Wales, the principal features of which have been noticed from another source [*R.A.M.*, xiv, p. 516].

Noble (R. J.). **An epiphytotic of ergot in Paspalum in New South Wales.**—*J. Aust. Inst. agric. Sci.*, ii, 2, pp. 76–78, 1936.

The widespread occurrence of ergot (*Claviceps paspali*) [*R.A.M.*, xv, p. 504] on paspalum (*Paspalum dilatatum*) is recorded throughout the coastal areas of New South Wales during the summer of 1935–6. Water couch (*P. distichum*) was also severely affected by the disease, which was observed on *P. urvillei* as well. Meteorological conditions were abnormally moist and cool and frequently resulted in the presence

of films of moisture on the young paspalum seed heads during December, January, and February, when the disease reached its full development in the Sydney area. Enormous quantities of ergots were formed but analysis showed the alkaloid content to be too low (not more than 0·01 per cent. ergotoxin) [cf. above, p. 720] for the material to be of economic value. Few cases of stock poisoning occurred during the early months but more were reported as the ergots matured.

Tabajdy (K.). **A Biborhere rákbetegsége.** [Crimson Clover rot.]—*Mezőgazdasag*, xii, pp. 54–55, 1935. [Abs. in *Herb. Abstr.*, vi, 1, pp. 60–61, 1936.]

Crimson clover (*Trifolium incarnatum*) in Hungary is liable to decay by three fungi, viz., *Sclerotinia trifoliorum* [*R.A.M.*, xv, p. 299], *Mitrula sclerotiorum* [ibid., xiii, p. 519], and *Typhula trifolii* [loc. cit.], a biological study of which is presented. Infection begins to appear in the autumn, when the plants wilt and die back, especially in wet weather, and the spread of the fungi is not prevented by snow. Conditions favouring the development of the clover-rotting organisms include unduly early (August) sowing, resulting in dense autumn stands, excessive use of nitrogen, and failure to practise crop rotation. Other clovers are also susceptible to the fungi under observation, but *T. incarnatum* is their preferred host.

Rădulescu (E.). **Die Bedeutung der Züchtung des Lieschgrases (Timothee) auf Rostresistenz.** [The importance of breeding Timothy grass for rust resistance.]—*Züchter*, vii, pp. 324–326, 1935. [Abs. in *Herb. Abstr.*, vi, 1, p. 61, 1936.]

Observations are in progress at the Cluj (Rumania) Plant Breeding Station on the development of lines of *Phleum pratense* resistant to rust [*Puccinia phlei-pratensis*: *R.A.M.*, xv, p. 514]. During the second year of cultivation (1934–5) 11 immune clones showed more vigorous spring growth, tillering, and development after mowing than 14 susceptible ones, while the yields of the former are progressively increasing and those of the latter steadily declining.

Umpleby (E.) & Swarbrick (T.). **The incidence of canker in young cider Apple trees.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 98–103, [1936].

Observations on a block of young cider apple trees in the vicinity of Bristol indicated that two forms of apple canker [*Nectria galligena*: *R.A.M.*, xv, p. 514] exist, of which by far the more prevalent and serious develops through a bud or wound. The other, termed 'paper' canker, consists of large, sunken areas of bark usually along the main stem, the bark in the more advanced stages turning pale and peeling off in thin, paper-like layers. The sudden appearance of the disease in the plot and the virulence of the attack were extraordinary, stems being girdled within a few weeks. High resistance was shown by the Ellis Bitter, Royal Wilding (no canker in approximately 100 trees of each variety) and Silver Cup varieties, while Knotted Kernel, Sweet Alford, and Stoke Red had under 3 per cent. canker in 300 to 400 trees. Kingston Black showed over 40 per cent. canker on 250 trees. Susceptible

varieties, such as Kingston Black, Cap of Liberty, Cowarne Red, and Frederick, should always be head-grafted on a canker-resistant stem builder, for which purpose Bulmer's Norman (reasonably resistant in these trials) and Sweet Alford are recommended. No clear evidence was obtained of any effect of the rootstock on canker susceptibility.

Stevens (N. E.). **Two species of Physalospora in England.**—*Mycologia*, xxviii, 4, pp. 330–336, 1936.

This paper reports the finding in England of the ascigerous stages of *Physalospora obtusa* [*R.A.M.*, xv, p. 467] on apple and hawthorn (? *Crataegus oxyacantha*) and of *Diplodia mutila* [ibid., xiv, p. 423; xv, p. 701] on apple and ash (*Fraxinus excelsior*). The *Physalospora* stage of the latter has not been recorded before and the author names it *P. mutila* (Fr.) n. comb. [with a diagnosis in English]. The perithecia are borne in the pycnidial or similar stromata, paraphyses are numerous, branched, interwoven, and apparently anastomosing; asci are regularly 8-spored, and ascospores are hyaline, non-septate, a few becoming two-septate, 30 to 39 by 12 to 16 μ mostly 30 to 36 by 13 to 14 μ. The species differs from *P. obtusa* chiefly in the larger size of the ascospores and the size, appearance, and time of colouring of the pycnospores. The folly of attempting to link up stages of fungi of this group on the basis of association was illustrated by the occurrence of *D. sarmentorum* in quantity on the ash stick on which *P. mutila* was found. The distribution and synonymy of *D. sarmentorum* are discussed in detail.

Halperin (L.). **Informe sobre el ataque de Sphaeropsis malorum al Manzano en el Delta.** [Report on the attack of *Sphaeropsis malorum* on the Apple in the Delta.]—*Bol. Minist. Agric., B. Aires*, xxxvii, 1–4, pp. 39–49, 7 figs., 1936.

An account is given of the symptomatology and etiology of an apple disease recently observed in seven estates in the Delta region of the Argentine, where it appears to be generally distributed, and unless controlled appears likely to destroy whole orchards. The author attributes the disease to *Physalospora cydoniae*, the pycnidial stage of which he regards as *Sphaeropsis malorum* Berk. [*Diplodia mutila*: see preceding abstract]. Only the pycnidial stage was observed. The pycnospores are described as oblong, ellipsoid, 16 to 36 by 7 to 16 μ, at first hyaline or lightly coloured but gradually becoming dark chestnut [apparently in the pycnidium: in this character resembling *S. malorum* Peck (*P. obtusa*): *R.A.M.*, xiii, p. 312]; only unicellular spores have been observed. The Sarmiento [runner] and Mitre varieties appear to be the most resistant and Jonathan and Winter Banana relatively so. Directions are given for control based on plant sanitation, the use of resistant varieties, and spraying.

Christopher (E. P.). **The effect of flotation sulphur spray on the CO_2 assimilation of Apple leaves.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 149–151, 1936.

Data are presented to show that even flotation sulphur, which causes relatively little foliage scorch in comparison with lime-sulphur as a treatment for apple scab [*Venturia inaequalis*: *R.A.M.*, xv, p. 592],

may be responsible for some reduction in the carbon dioxide assimilation of the leaves. Thus, 20-year-old McIntosh trees treated in the orchard in September, 1934, with 1 in 55 flotation sulphur paste, assimilated only 79 per cent. of the amount of carbon dioxide absorbed by the unsprayed foliage, the corresponding figure for Baldwins treated in the greenhouse in the following spring being 82 per cent. This decrease is not nearly as serious as that reported by Hoffman in connexion with lime-sulphur for the same purpose [ibid., xiv, p. 183 and next abstract].

Hoffman (M. B.). **The effect of lime-sulphur spray on the respiration rate of Apple leaves.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 173–176, 1936.

Baldwin apple leaves sprayed with lime-sulphur 1 in 40 at a temperature of 25° C. on 17th June, and at 32° on 18th July, 1934, showed a slightly greater rate of apparent respiration than untreated ones [cf. preceding abstract], but the injury to sprayed foliage is thought to be due less to this factor than to decreased photosynthesis. In the July test the sprayed leaves assimilated on 19th July over 5 mg. less carbon dioxide per hour per 100 sq. cm. of leaf surface than the untreated foliage, whereas the carbon dioxide respired on the two following days averaged 0·9 and 0·38 mg. more.

Clore (W. J.). **The effect of Bordeaux, copper, and calcium sprays upon carbon dioxide intake of Delicious Apple leaves.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 177–179, 1 graph, 1936.

In experiments carried out in Washington on two-year-old Delicious apple whips the carbon dioxide assimilation rates of the leaves treated with 4–4–50 Bordeaux mixture did not differ appreciably from those of the untreated foliage [*R.A.M.*, xiii, p. 35]. Three leaves sprayed with 4–0–50 copper sulphate, however, developed a purplish-brown spotting [ibid., xii, p. 29] over the entire lamina, although there was no decrease in carbon dioxide assimilation. A marked decline in carbon dioxide intake was associated with severe burning in two out of three leaves sprayed with 0–4–50 hydrated lime [see preceding and next abstracts].

Swartwout (H. G.). **Some notes on spray injury.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 180–182, 1936.

In spraying tests on eight commercial apple varieties in Missouri in 1935 severe russeting (78·4 per cent. on Ben Davis and 41·1 per cent. on Delicious) was caused by treatment with a mixture of 1¼ lb. lime-sulphur and 1 lb. lead arsenate in 50 galls. water [see preceding abstracts], the corresponding amounts for a similar mixture containing only ¾ lb. lime-sulphur being 55·9 and 18·1 per cent., respectively, and for ½ lb. on Delicious 16 per cent. The incidence of russeting was reduced by the substitution of dry for liquid lime-sulphur (6 to 100), the former also imparting a superior finish to the fruit. Flotation sulphur and calcium monosulphide [ibid., xv, p. 485] with lead arsenate also caused less russeting than lime-sulphur.

Moore (M. H.) & Montgomery (H. B. S.). **A field spraying trial of combined fungicide-contact-insecticide sprays in 1935. A progress report.**—*Rep. E. Malling Res. Sta., 1935*, pp. 191–197, 1 fig., 2 graphs, 1936.

In further spraying tests with combined fungicide-contact-insecticide sprays at East Malling [*R.A.M.*, xiii, p. 708] better control of scab (*Venturia inaequalis*) on Cox's Orange Pippin apple trees was given by two pre-blossom (followed by post-blossom) applications of lime-sulphur, with lead arsenate and petroleum-oil emulsion than by one. The applications made at green-bud and pink-bud caused severe leaf burn and defoliation. Three applications (pink-bud, petal-fall, and three weeks after) of lime-sulphur with certain added materials gave good control of scab and red spider (*Oligonychus ulmi*) [*Paratetranychus pilosus*]. Trees on stocks V, X, I, or III showed more heavily infected leaves than those on IX, II, XIII, or XVI. The addition of oil-emulsion or lethalate wetting [ibid., xiii, p. 104] to lime-sulphur did not increase its effectiveness.

Thomas (P. H.). **The control of black spot in Pears.**—*Fruit World, Melbourne*, xxxvii, 6, p. 7, 1936.

In spraying experiments for the control of black spot [scab] of pears (*Venturia pirina*) in Tasmania during the 1934–35 season, the application to the Beurré Bosc and Winter Nelis varieties of strong Bordeaux mixture (6–4–40 diminishing gradually to 1½–2–40 for the fifth and sixth applications) resulted in 97 per cent. marketable pears, whilst weak Bordeaux (4–4–40 to 1–1–40) gave 94 per cent. and the unsprayed controls 13 per cent. The omission of the calyx spray reduced the percentage of marketable fruit to 60.

Davis (L. D.) & Tufts (W. P.). **Black-end of Pears. III.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 304–315, 4 figs., 2 graphs, 1936.

Black end, a limiting factor in Californian pear production [*R.A.M.*, xii, p. 615 and next abstract], has been observed during a lengthy investigation period not to spread from tree to tree in the orchard, but individuals maintain their relative position with respect to the severity of the disease from year to year. In other words, the tendency of a tree to produce diseased fruits neither increases nor declines with advancing age. Field experiments have clearly demonstrated the importance of *Pyrus serotina* rootstocks in the etiology of the disease, and details are given of the satisfactory performance of severely affected Bartlett trees cured by the severance of the connexion between the scion and the stock, for which inarches of *P. communis* were substituted. In other tests scaffold branches, separated from the main tree and grafted on *P. communis* inarches, bore normal fruit while the portions of the tree still attached to the *P. serotina* stock continued to produce black end pears. Promising results have also been given by the use of quince stocks.

Attention is drawn to various unusual features in this rootstock effect, including, besides the above-mentioned stability of individual reactions, the virtual absence of symptoms on the tree itself as distinct from the fruit.

Negative results were given by attempts to improve the condition of the trees by drastic pruning, soil treatments, and chemical injections.

Davis (L. D.) & Moore (N. P.). **Black-end of Pears. IV. P_H of Bartlett Pear fruits.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 316–322, 2 figs., 1936.

Laboratory and field data are presented indicating that a connexion exists between the hydrogen-ion concentration of Bartlett pear juice and the occurrence of black end [see preceding abstract], which is liable to be associated with increasing alkalinity (P_H 4·60 to 4·90 at the most severely affected calyx end compared with 4·10 to 4·35 for healthy fruit in one orchard test). The exact nature of this relationship is still obscure.

Beard (F. H.) & Wormald (H.). **Bacterial canker of Plum trees in relation to nutrition. Experimental results in sand cultures.**—*Rep. E. Malling Res. Sta., 1935*, pp. 146–152, 1936.

In an experiment designed to ascertain whether the susceptibility of plum trees to bacterial canker (*Pseudomonas mors-prunorum*) could be modified by increasing or decreasing the amounts of certain minerals present in the soil [*R.A.M.*, xiii, p. 710] 42 two-year-old Victoria plum trees worked on myrobolan A stock were planted in pots containing pure sand and fed with the following nutrient solutions, viz., (1) complete nutrient solution, (2) double nitrogen, (3) low nitrogen, (4) half potassium, (5) no potassium, (6) quadruple phosphate, and (7) low phosphate. Eventually the stems were inoculated with *P. mors-prunorum*. The average lengths of the resultant cankers in the seven series listed above were, respectively, 33, 17, 20, 14, 17, 38, and 3 cm., the low phosphate treatment markedly reducing susceptibility to canker. Cankering was most severe in the quadruple phosphate and complete series (the latter relatively high in potassium), but with the exception of one tree, was low in the half potash series. Until further information is available heavy dressings of potash or phosphatic fertilizers should not be applied to soils in which plum bacterial canker is prevalent.

In an appendix by W. A. Roach (pp. 152–154) it is stated that a study of the availability of the iron in the culture solutions indicated that the degree of resistance to canker was sufficiently parallel to both the acidity of the culture solution and the availability of the iron to raise the question whether it may depend on a highly acid growth medium or one rich in iron or a combination of both [cf. ibid., xv, p. 110]; further investigations are in progress.

Wormald (H.). **Notes on the silver leaf disease.**—*Rep. E. Malling Res. Sta., 1935*, pp. 155–157, 2 figs., 1936.

The rapid infection and dying-off of four young plum trees is recorded following inoculation with cultures of *Stereum purpureum* [*R.A.M.*, xv, p. 676]; the fungus penetrated throughout the stem and into the roots to a maximum distance of 3 ft. 9 in. from the point of inoculation in 10½ months. A comparable instance of rapid infection was observed on a naturally infected double-grafted pear. A cankered area with papery

bark extended about 9 in. downwards from the upper union, whence infection appeared to have spread into the rootstock in about six months.

PITTMAN (H. A.). **Exanthema of Citrus, Japanese Plums and Apple trees in Western Australia.**—*J. Dep. Agric. W. Aust.*, xiii, 2, pp. 187–193, 4 figs., 1936.

Brief descriptions are given of the symptoms and occurrence of exanthema of citrus [*R.A.M.*, xiv, pp. 505, 628] and of Japanese plums [? *Prunus salicina*: ibid., ix, p. 192] in Western Australia.

A peculiar blistering of the bark on rapidly growing shoots of Granny Smith apple trees on poor, gravelly soils has been encountered on several occasions, and since the trouble yields to soil applications of copper sulphate the author considers that it can be included under the term exanthema [ibid., vii, p. 643]. Control measures should be based on careful selection of site, especially for oranges, the application of stable manure or a well-balanced fertilizer, the use of green manures, efficient drainage, and the application to the soil of copper sulphate ($2\frac{1}{4}$ or 3 lb. per tree, shortly after the autumn rains begin, followed in subsequent years by one-quarter of this amount), or by spraying with Bordeaux mixture.

HOAGLAND (D. R.), CHANDLER (W. H.), & HIBBARD (P. L.). **Little-leaf or rosette of fruit trees. V. Effect of zinc on the growth of plants of various types in controlled soil and water culture experiments.**—*Proc. Amer. Soc. hort. Sci., 1935*, xxxiii, pp. 131–141, 9 figs., 1936.

Little leaf [*R.A.M.*, xiv, p. 767] symptoms were experimentally induced on apricot seedlings and nursery trees, Turkish tobacco, Santa Clara Cannery tomatoes, yellow mustard, summer squash, Golden Bantam maize (the appearance of which resembled that of 'white bud' plants [ibid., xiv, p. 576]), Sacramento barley, Russian Mammoth sunflower, and Acala cotton (*a*) in a sandy subsoil from a diseased peach orchard at Delhi, California, and (*b*) in water cultures in which zinc was omitted from the nutrient solution. Grimm's lucerne remained apparently unaffected by the absence of zinc, as might be expected from its good growth in little leaf orchards. In apricots a necrotic condition further developed as a result of boron deficiency in the nutrient solution used in the water culture experiments, and it was shown that 0·5 p.p.m. of this element was necessary to ensure proper growth. Commercial dried sheep manure, at the rate of 50 gm. per 2-gall. jar, completely prevented little leaf on all the plants (except maize) grown in zinc-deficient soil, while zinc sulphate, as in the previous year's experiments, exerted a uniformly beneficial effect when applied to the soil in solutions of 0·10 to 0·20 gm. per 10 kg.

HARTZELL (A.). **Incubation period of Peach yellows in its insect vector.**—*Contr. Boyce Thompson Inst.*, viii, 2, pp. 113–120, 1 fig., 1936.

The incubation period of the virus of peach yellows [*R.A.M.*, xv, p. 587] in its insect vector (*Macropsis trimaculata*) was determined by allowing nymphs collected from wild plum (*Prunus americana*) and

tested for non-infectivity to feed for periods of 1, 4, 7, and 10 days while caged on yellowed peach seedlings, and then transferring them to healthy peach seedlings where they fed for periods of from 1 to 24 days. From 4 to 20 insects were used in each test.

The results showed that 7 or 14·6 per cent. of the trees became infected and only nymphs of the 4-day series transmitted the disease. The maximum incubation period of the virus within the insect was found to range from 10 to 26 days with an average of 16 days. The minimum period observed was from 7 to 8 days. All infections were obtained with insects that had been infected in the nymph stage except in one instance in which the leafhoppers had reached the adult stage before being exposed to infection. In this case the maximum incubation period in the insect was 26 days. The incubation period of the virus in the peach tree was from June and July to the following February and March.

Canonaco (A.). **Il seccume dei rametti di Mandorlo in relazione ad alcuni micromiceti.** [Withering of Almond branches in relation to certain micromycetes.]—*Riv. Pat. veg.*, xxvi, 5–6, pp. 145–164, 1 pl., 1 fig., 1936.

Almond trees growing in the vicinity of Palermo showed a withering of the young branches and death of the buds attributed to a fungus which the author names *Phomopsis amygdalina* n. sp. [with a Latin diagnosis]. The fungus is characterized by depressed, globose, subepidermal, later erumpent pycnidia measuring 180 to 300 μ in diameter (up to 520 μ when confluent), filiform or subulate sporophores, 10 to 12 by 1·5 to 2 μ, and fusoid or ovate-fusoid, hyaline α-spores seldom exceeding 5 to 8 by 1·8 to 2·5 μ. The fungus probably infects the stems through leaf scars in the autumn and continues development round the buds, as long as weather conditions allow, killing the shoots and branches. It resumes activity in the spring and forms pycnidia. In culture the fungus grew fairly readily on decoctions of carrot and almond with agar added but pycnidia developed only occasionally. Infection experiments are not described. The paper terminates with notes on prevention and control by improved cultural methods and spraying with Bordeaux mixture or lime-sulphur.

Spinks (G. T.) & Clothier (G. E.). **The incidence of 'reversion' in seedling Black Currants and in clones derived from them.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 58–66, [1936].

Observations on the incidence of reversion [*R.A.M.*, ix, p. 599] on about 2,500 seedling black currants and clones from selected seedlings (the seedlings being produced by crossing or self-fertilizing standard varieties and raised primarily to obtain new varieties), showed that most of the seedlings remained healthy for six years, but the disease was found on a few four-year-old plants. Some clones from apparently healthy seedlings became severely affected within four years, though others remained free for ten. Systematic roguing of infected clones for two years largely eliminated visible signs of the disease, but reverted plants appeared again after a further two years. In some cases the

disease may have reappeared after remaining latent during the two years, though in others the infections appeared to be new.

Massee (A. M.). **Studies on the transmission of the Strawberry virus 'yellow-edge' disease by insects. II. Aphis transmission experiments and period of infectibility.**—*Rep. E. Malling Res. Sta., 1935*, pp. 171–176, 1936.

Further investigations at East Malling confirmed the earlier finding that the strawberry yellow edge virus is transmitted by the delicate strawberry aphid (*Capitophorus fragaefolii* Cockll.) with which *Myzus fragaefolii* and *C. fragariae* are synonymous [*R.A.M.*, xiv, p. 596]. Transmission by the insect occurred in May, June, and July. Five aphids were enough to effect transmission from a diseased to a healthy plant, the symptoms of the disease appearing seven weeks after inoculation.

Ogilvie (L.) & Thompson (C. R.). **A Strawberry disease resembling the American 'crimp'.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 76–79, 1 pl., [1936].

Since 1929 strawberries of the Madame Kooi variety grown in the Cheddar area have been affected by a condition resembling crimp or dwarf [*R.A.M.*, x, p. 42; xi, p. 380]. The leaflets are markedly 'ballooned', with turned-down edges, brittle, dark, and often show transverse corrugations. Large, pale green, later dark brown, necrotic areas may develop on the leaflets and petioles. The tips of the runners may be swollen, and the fruit of abnormal shape. Symptoms resembling 'red plant' may be present. Experimental evidence showed that soil sterilization by steaming reduced infection, which is attributed to the nematode *Aphelenchoides fragariae*. No typical 'cauliflower plants' [above, p. 724] were found either at Cheddar or in the experimental plots.

Foëx (E.) & Lansade (M.). **Une bactériose du Bananier.** [A bacteriosis of the Banana.]—*C.R. Acad. Sci., Paris*, ccii, 26, pp. 2173–2175, 1936.

From the vascular and parenchymal tissues of bananas received from Beyrouth (Syria), where they are subject to an internal greyish-yellow to brown or black rot extending from the terminal bud to the collar and resulting in cessation of growth, the writers isolated *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* [*R.A.M.*, xii, p. 382; xv, p. 359], the pathogenicity of which was shown by inoculations to be very limited, and four bacteria, one of which (4B) produced on *Musa basjoo* S. & Z. and *M. sapientum* symptoms corresponding to those observed in nature. The organism is motile by one to three polar flagella, 1·3 by 0·4 μ, Gram-negative, non-acid-fast, liquefying gelatine, not coagulating milk, reducing nitrates, or fermenting carbohydrates, producing ammonia, and growing on Fermi's but not on Uschinsky's medium; it is named *Bacterium maublancii* n. sp.

Schnellhardt (O. F.) & Heald (F. D.). **A study of the toxic action on gray-mold spores of cleaning solutions used in spray residue removal.**—*Phytopathology*, xxvi, 6, pp. 564–577, 2 figs., 1936.

One of the two principal agents of decay in stored apples in Washington is *Botrytis cinerea* [*R.A.M.*, x, p. 675], the other being *Penicillium*

expansum [ibid., xiii, p. 781]. The washing tank is a prolific source of contamination by *B. cinerea*, becoming contaminated by spores from the surface of normal fruit, from an occasional decayed apple passing into the machine, and from atmospheric dust. Of the three cleaners commonly used in the removal of spray residue from the fruit, sodium silicate [ibid., xiv, p. 173] at a concentration of 75 lb. per 100 galls. water proved to be the most toxic to *B. cinerea* spore suspensions, killing 95·5 per cent. of the spores in five minutes at room temperature and all in the same time at 90° F., in three minutes at 100°, in two at 110°, and in one at 120°. Hydrochloric acid at a strength of 3 per cent. by volume destroyed 81·3 per cent. of the spores in 104 hours at room temperature and all in 25 to 36 hours at 90°, in 7 at 100°, and in 15 minutes at 120°. At 90° and room temperature the spore percentages killed by sodium carbonate (75 lb. per 100 galls.) in 101 hours were 100 and 98·8, respectively, the periods required for complete killing at 110° and 120° being 11 hours and 20 minutes, respectively. The corresponding figures for the elimination of the spores in the control flasks of water alone are given.

The practical conclusion from these experiments is that the risk of grey mould infection during washing operations may be largely obviated by the use of sodium silicate at relatively high temperatures. Recently the practice of tandem or double washes to clean lead arsenate-sprayed fruit has been adopted, and excellent results may be obtained by the treatment of apples, first with hydrochloric acid and then with sodium silicate or vice versa. Should a milder alkali be preferred to sodium silicate, sodium carbonate-trisodium phosphate or soda ash may be substituted.

McCallan (S. E. A.) & Wilcoxon (F.). **The action of fungous spores on Bordeaux mixture.**—*Contr. Boyce Thompson Inst.*, viii, 2, pp. 151–165, 2 figs., 4 graphs, 1936.

By using sodium diethyl dithiocarbamate which gives a yellowish colour with very dilute ammoniacal copper solutions [*R.A.M.*, x, p. 475; xv, p. 505] the mother liquor of freshly prepared 4–4–50 Bordeaux mixture was shown to contain about 1 p.p.m. of soluble copper. The amount of copper that goes into solution in distilled water in contact with dried Bordeaux deposit did not exceed 0·3 p.p.m., an amount insufficient to affect the germination of most species. But when the filtrate from a spore suspension (prepared by a vacuum technique without allowing contamination with the nutrient medium and allowed to stand several hours) was placed over dried Bordeaux mixture the copper dissolved varied with the species and was directly proportional to the number of spores. For extracts of 100,000,000 spores the values in mg. were as follows: *Uromyces caryophyllinus* 1·01, *Sclerotinia fructicola* 0·76, *Neurospora sitophila* 0·12, *Botrytis paeoniae* 0·10, *Glomerella cingulata* 0·046, *Aspergillus niger* 0·023, and *Alternaria solani* 0·013. Those species most active in bringing copper into solution excreted the greatest amount of solids and were also the most sensitive to the toxic action of Bordeaux mixture.

Ultrafiltration tests showed that the active material in spore excretions is in true solution. By collecting 360,000,000,000 spores of *Neuro-*

spora sitophila a quantity of spore excretion was obtained and chemical determinations indicated the presence of 3·1 per cent. malic acid and 0·75 per cent. amino nitrogen. Spore excretions are practically neutral and cannot act from any acidic properties. Copper as sodium cuprimalate and as a copper glycine derivative was found to exert a toxicity substantially the same as in the form of copper sulphate and the authors conclude that the salts of hydroxy acids as well as of amino acids present in spore excretions act on Bordeaux mixture to form soluble toxic copper hydroxy and copper amino salts.

BEELEY (F.). **The F.M.S. Government scheme for the testing and approval of fungicides for the treatment of mouldy rot on Rubber trees.**—*Malay. agric. J.*, xxiv, 6, pp. 257–267, 1 graph, 1936.

The difficulty of disinfecting the delicate cambial tissues, exposed in the tapping of rubber, against mouldy rot (*Ceratostomella fimbriata*) led to the testing of proprietary preparations available on the Malayan market to determine those most suitable for use. From this beginning the author traces the development of the present organization for the testing and approval of disinfectants by the Rubber Research Institute [*R.A.M.*, xi, p. 768]. Under this scheme the cost of testing is borne by the proprietor who has to deposit $200 with the Institute before a test is undertaken, and to guarantee that the formula for the composition of the preparation will not be changed without sanction. The Institute has the right of publication of results of tests whether good or bad and the receipt of more than three complaints may entail the removal of a product from the white list. At present the approved substances are agrisol, izal, black cyllin, killgerm, kilsol red, brunolinum plantarium [ibid., x, p. 550], agrisol white, cargillineum B [ibid., xii, p. 597], and durycolium.

A detailed description is given of the laboratory and field tests formulated for the testing of these substances. Penetration tests on living bark are made to determine injury. Laboratory tests showed the toxicity of products to cultures of *C. fimbriata* to be so low as to afford no indication of value for mouldy rot control. Better results were obtained by the following method. Clean strips of living bark, 6 by 1 by $\frac{1}{4}$ in. are placed in sterile tubes and inoculated with *C. fimbriata*. A sporing culture is obtained in 7 days when it is immersed in the fungicide under test and scrapings of the fungus removed at short intervals for 30 mins. for washing and culturing. This test is, however, so inferior to the field test that the latter is considered the only suitable final test of the efficacy of a fungicide for mouldy rot control. In carrying out field tests plots of 25 trees, each showing complete infection of the panel, are selected in a heavily infected area, the neighbouring trees serving as controls. The tests are carried out at different concentrations to determine the probable minimum strength required to kill the fungus and the maximum strength at which the fungicide can be applied to the bark without injury. When treatment is stopped the time required for the reappearance of mould is noted. Preparations are rejected which fail to control the disease during a period of one month and which injure the bark at or near the strength required for killing.

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PETRI (L.). **Se ed in quali limiti i composti del rame possano essere sostituiti da altri sali metallici o da altri prodotti nazionali nella fabbricazione degli anticrittogamici.** [Whether, and within what limits, copper compounds can be replaced by other metallic salts or national products in the manufacture of fungicides.]—*Nuovi Ann. Agric., Roma*, xvi, 2, pp. 81–92, 1936.

After fully discussing the results obtained in recent years in different countries and particularly in Italy from investigations into the possibility of replacing copper compounds in fungicides by cheaper or home-made materials, the author concludes that copper-lime and copper-sodium sprays and colloidal preparations with a copper salts base should be replaced by alkaline polysulphides in the case of diseases amenable to control by sulphur compounds, such as *Venturia pirina*, *V. inaequalis*, *Exoascus* [*Taphrina*] *deformans*, *Cycloconium oleaginum*, and many others. Against diseases caused by species of *Botrytis* copper fungicides may be replaced by either alum and gypsum, aluminium sulphate and gypsum or lime, calcium bisulphite, or sodium bisulphite. Aluminium sulphate can be used to protect seedlings against *Rhizoctonia* infection from the soil [*R.A.M.*, xii, p. 269 *et passim*], seed disinfection of certain plants can be effected with zinc oxide, wounds can be disinfected with zinc chloride (especially against bacteria), and potato tubers can be protected against black scurf [*Corticium solani*] with mercuric chloride. The concentration of copper sprays should be reduced, especially in those localities where spring is not accompanied by frequent rain. A well-organized system of warning growers of the likelihood of vine mildew [*Plasmopara viticola*] outbreaks would reduce the number of spray applications to a minimum. The author also recommends that attempts should be made to produce a fungicide with an organic mercury salt basis, which possesses adhesive properties and does not burn the foliage.

KEARNS (H. G. H.), MARSH (R. W.), & MARTIN (H.). **Combined washes. Progress report. II.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 37–48, [1936].

In 1935, further extensive field trials with combined insecticidal-fungicidal sprays were arranged at Long Ashton [*R.A.M.*, xiv, p. 701], but owing to a total loss of crop as a result of frost it was impossible to assess the value of some of the materials. The data obtained, however, showed, *inter alia*, that a refined white oil (5 per cent.) emulsified with sulphite lye and mixed with 3 per cent. lime-sulphur was safely applied to apple varieties at the green flower stage, and is probably not less effective in the control of scab [*Venturia inaequalis*] than lime-sulphur alone.

JOËSSEL (P. H.) & SUAU (J.). **Produits mouillants ou adhésifs dans les traitements mixtes contre le Carpocapse et la tavelure.** [Wetting or adhesive agents in combined treatments against codling moth and scab.]—*Ann Épiphyt.*, N.S., ii, 1, pp. 31–49, 1936.

A detailed account is given of a series of comparative tests in which Beurré Giffard pear trees were sprayed against codling moth [*Cydia pomonella*] and scab [*Venturia pirina*] with arsenical and cryolite Bor-

deaux mixture with the addition of casein as an adhesive, amyl alcohol as a wetter, or a combined adhesive and wetter, i.e., either biliary salts, colloidal resin, or sulphonate terpenic alcohol [cf. *R.A.M.*, xv, p. 590]. Results were obtained regarding the insecticidal efficacy of the sprays but practically no scab developed on the treated trees or the controls during the period of the experiment.

Dutton (W. C.) & Farish (L. R.). **Comparisons of high-calcium and dolomitic hydrated limes in Bordeaux, zinc-lime and iron-lime on Cherry and Peach.**—*Proc. Amer. Soc. hort. Sci.*, *1935*, xxxiii, pp. 186–190, 1936.

In experiments carried out on Montmorency cherries at the Michigan Agricultural Experiment Station to compare the value of high-calcium and dolomitic hydrated limes used as constituents of Bordeaux mixture [*R.A.M.*, xiv, p. 677] it was found that with both kinds of lime at the strengths used (2–3–100, 4–6–100, 6–9–100, and 8–12–100) terminal growth diminished in 1934 as the strength of the mixture increased owing possibly to drought effects being accentuated by the Bordeaux, whereas in 1935 these relations were in general reversed. Bordeaux in any form was shown to be liable to accentuate the normal leaf-fall of cherries due to drought and on the whole the injury was more pronounced with high calcium than with dolomitic lime. The latter part of the paper concerns the use of iron-lime and zinc-lime as arsenical correctives on the peach.

Kadow (K. J.), Ruth (W. A.), & Anderson (H. W.). **Greenhouse wires and pipes galvanized with zinc react with sulphur dioxide to form soluble zinc salts.**—*Phytopathology*, xxvi, 6, pp. 609–610, 1936.

Tomatoes in Illinois greenhouses were severely injured in 1935 by the zinc thiosulphate, or the oxidized product zinc sulphate, formed by the reaction of the zinc-galvanized wires and pipes with the sulphur dioxide used in fumigation for the control of various diseases [*R.A.M.*, xii, p. 524]. The crystals on the galvanized surfaces slowly dissolved in condensed moisture and the resultant solution dripped on to the plants, causing brownish-black to black lesions.

Childers (N. F.). **Some effects of sprays on the growth and transpiration of Tomatoes.**—*Proc. Amer. Soc. hort. Sci.*, *1935*, xxxiii, pp. 532–535, 1936.

Over ten-day periods of low (January) and high (April) evaporation periods in Missouri in 1934, the application of 3–4–50 Bordeaux mixture to mature Marglobe tomatoes in the greenhouse was virtually without effect on the total amount of water transpired [*R.A.M.*, xiv, p. 708 and above, p. 727]. Bordeaux plus heavy oil (0·6 per cent.), copper sulphate, and colloidal copper (each at 1 in 500) had little effect, the tendency, if any, being toward a decrease, but heavy oil alone caused a marked though only temporary reduction in the transpiration rate, especially under high evaporation conditions. In field tests the Bordeaux treatment (particularly in the absence of oil) caused a noticeable reduction

in plant growth, yield, and fruit size during extremely dry weather, under which conditions it should probably be omitted unless absolutely indispensable from the disease control standpoint.

VERGUIN (J.). **Les produits chimiques et la défense des cultures.** [Chemical products and crop protection.]—*Rev. Chim. industr.*, xlv, 530, pp. 38–44; 531, pp. 58–63; 532, pp. 90–100, 1936.

This is a review, followed by a seven-page bibliography, of some outstanding contemporary investigations on the application of a number of fungicidal, insecticidal, and adhesive substances to crop protection. Most of the relevant literature has been noticed from time to time in this *Review*.

BLANK (I. H.) & TIFFNEY (W. N.). **The use of ultra-violet irradiated culture media for securing bacteria-free cultures of Saprolegnia.**—*Mycologia*, xxviii, 4, pp. 324–329, 1 fig., 1936.

Bacteria-free cultures of *Saprolegnia* were readily obtained from contaminated material by cultivation on a medium (5 ml. per 4·5 cm. Petri dish) composed of peptone 1 gm., levulose 5 gm., agar 20 gm. per l. and exposed to ultra-violet rays for 3 hours before use. The inhibition of bacteria is due to the presence of a growth-inhibiting substance resulting from the action of the rays on the carbohydrate constituent of the medium. Little or no inhibition of fungus growth was observed. Any of the common carbohydrates may be used for the medium, but the concentration of proteins should be kept low. The method is thought to be applicable to the isolation of other fungi.

RAWLINS (T. E.) & TOMPKINS (C. M.). **Studies on the effect of carborundum as an abrasive in plant virus inoculations.**—*Phytopathology*, xxvi, 6, pp. 578–587, 1 fig., 1936.

Details are given of the technique and results of experiments in the transmission of various plant viruses by means of abrasion of the leaves with 600-mesh powdered carborundum, dusted over the surface through the small apertures of a salt-shaker prior to the application of the virus suspension with sterilized absorbent cotton. The method proved successful in the case of spotted wilt of tomato and lettuce [*R.A.M.*, xv, p. 538], broad bean [*Vicia faba*] mosaic, a Californian celery mosaic [ibid., xv, p. 191], cauliflower mosaic [ibid., xiv, p. 207], and sugar beet mosaic, considerably increasing the percentages of infection over those obtained by the standard technique of rubbing.

It was shown by histological examination that the epidermal cells of leaves thus inoculated are frequently pierced by the carborundum crystals which, however, presumably do not injure the tissues sufficiently to prevent the multiplication of the virus within them.

RAYNER (M. C[HEVELEY]). **The mycorrhizal habit in relation to forestry. II. Organic composts and the growth of young trees.**—*Forestry*, x, 1, pp. 1–22, 6 pl., 6 graphs, 1 diag., 1936.

In continuation of her studies on the growth effect on seedling conifers produced by the addition of certain organic composts to soils

in which the young trees suffer high mortality and marked inhibition of growth [*R.A.M.*, xiv, p. 410] the author gives comparative growth records on Scots pine (*Pinus sylvestris*), Corsican pine [*P. laricio*], and *P. contorta* var. *murrayana* in graphical form showing the average heights and height frequencies in control and treated populations in field plots, with dry weight records for the corresponding pot cultures. The composts used were prepared from straw, sawdust, dried blood, brewery hop waste, ammonium sulphate, and ammonium phosphate in various combinations and proportions, the nitrogen being added at one hundredth the air dry weight of the composting material. Each compost was added at the rate of 10 lb. per sq. yd.

As compared with the controls the root systems of treated plants showed an abundance of short roots with profuse mycorrhizal development. *Boletus bovinus* was isolated from mycorrhiza of treated plants and is believed to be present throughout the soil of the experimental area but is inhibited by factors not fully determined. The addition of certain composts relieves this condition, permitting normal activity of the mycelium.

In the series of pot culture experiments the results were in close agreement with those obtained from the field plots. Different reactions to the same compost was shown by the individual species of pine used, and especially so, in another series of tests, by larch. Experimental evidence was also obtained from pot cultures in potting soil that tomato and wallflower (which do not form mycorrhiza) and Scots pine showed no improved growth as the result of compost addition, whereas treated *Solanum dulcamara* and *Nicotiana* spp. (which form mycorrhiza) gave higher dry weights than the untreated.

The author concludes that these composts, by modifying the course of humus decomposition, bring about qualitative changes in the organic soil constituents deleterious to growth, whereby products are formed markedly beneficial to nutrition, growth, and mycorrhizal development of young conifers. The action of the composts is essentially different from manures containing significant additions of available nutrients. The relation of these results to current biological theories of soil ecology and mycorrhizal habit is briefly discussed.

Dykstra (T. P.). **Comparative studies of some European and American Potato viroses.**—*Phytopathology*, xxvi, 6, pp. 597–606, 4 figs., 1936.

Comparisons of certain European and American potato viruses were made at Corvallis, Oregon, on a number of varieties from both continents [*R.A.M.*, xv, p. 459]. The X virus was found to resemble the so-called latent virus of 'healthy' American commercial potatoes. Both the Y virus and the veinbanding virus (rugose mosaic minus the X component) produce a banding of the veins on tobacco leaves and belong to the same group, though they are not identical. Whereas the tuber-perpetuated veinbanding symptoms are manifested on most American varieties containing the X virus by necrosis of the lower leaf veins, without leaf drop, those infected by the tuber-perpetuated Y virus showed not only extensive foliar necrosis but also considerable leaf drop, while Bliss Triumph also developed necrosis of the petioles and stem striation.

Para-crinkle produces large, irregular, mosaic-like blotches on the foliage of American varieties quite distinct from the symptoms due to leaf-rolling mosaic [ibid., xii, p. 48] or any other American potato virus. Under cages in the field, pinpoint-like necrotic lesions, in addition to mottling, developed on the leaves of infected Burbanks.

Crinkle A [ibid., ix, p. 603; xii, p. 48] is composed of at least one other virus besides X, and the virus free from X produces symptoms similar to those of the corresponding components of mild mosaic and crinkle mosaic, but somewhat different in pattern and with less severe foliar crinkling. Virus C (Di Vernon top necrosis), described by Bawden in an unpublished thesis referred to by K. M. Smith [ibid., xii, p. 776], produced a severe top necrosis in the form of current season symptoms in all the American varieties tested. The X component which accompanies virus C was removed by grafting scions from affected plants on to the resistant seedling No. 41956. The C virus, which does not correspond with any of the known viruses occurring in the United States, was successfully transferred from the resistant seedling to President and Majestic.

Taylor (C. F.) & Blodgett (F. M.). **Further field experiments on Potato scab control in western New York.**—*Amer. Potato J.*, xiii, 6, pp. 145–150, 1936.

Further experiments in the control of potato scab [*Actinomyces scabies*] in a region of western New York where the soil averages at least P_H 6·0 [*R.A.M.*, xiii, p. 537; xv, p. 603] showed that seed treatment with hot or cold formalin consistently reduced the incidence of infection, which was increased, on the other hand, by the use of mercurial preparations either on the tubers or incorporated with the soil. The use of sulphate of ammonia as a constituent of the fertilizer was found to decrease tuber defects to a considerable extent.

The Netted Gem variety possesses a fairly high degree of resistance to serious scab injury under local conditions. White Blossom Cobbler is more resistant than Irish Cobbler, while within the Smooth Rural group, Pioneer Rural and Robson Seedling are slightly less susceptible to the disease than Heavyweight and No. 9.

Butcher (F. G.). **Studies of seasonal occurrence of injuries to Potato tubers in western New York.**—*J. econ. Ent.*, xxix, 3, pp. 486–490, 1 fig., 1 graph, 1936.

In connexion with a study from 1932 to 1935 of the seasonal occurrence of scab [*Actinomyces scabies*], scab-gnat (larvae of Sciarid flies), and millipede injuries on potato tubers in western New York, it was observed that the incidence of scab lesions consistently declined from 31st August to 10th October (59·1 per cent. on the former date and 22·48 on the latter in 1935). This phenomenon was accompanied by a steady increase of similar proportions in millipede damage, and it is suggested that the disappearance of the scab infections was due to the feeding of the insects on them. Scab-gnat injury apparently follows invasion by the fungus, and the data for this type of damage indicate that the millipedes also feed on the areas of larval infestation.

MARTYN (E. B.). **The diseases of Rice in British Guiana.**—*Agric. J. Brit. Guiana*, vii, 2, pp. 142–143, 1936.

Brief notes are given on the following diseases of rice recorded in British Guiana: blast (*Piricularia oryzae*) [*R.A.M.*, vi, p. 212; cf. xv, p. 255] does little harm and has only been found on the Blue Stick variety; man rice (*Fusarium moniliforme*) [*G. moniliformis*: ibid., xiv, p. 217; xv, p. 173] causes only negligible damage; mildewed heads (*Acrothecium lunatum* [*Curvularia lunata*: ibid., xiii, p. 357] and *Clasterosporium punctiforme*) [loc. cit.] occur during wet weather or in humid conditions; and sclerotium disease (*Sclerotium oryzae*) [*Leptosphaeria salvinii*: ibid., xv, p. 313] has recently reappeared on the Blue Stick variety, causing a large percentage of empty grains. Bunt (*Tilletia horrida*) [ibid., xiv, p. 222] has not been reported for some years.

ABE (T.). **Comparison of pathogenicity in different culture strains of Piricularia oryzae and varietal susceptibility of the Rice plant to the blast disease.**—*Ann. phytopath. Soc. Japan*, vi, 1, pp. 15–26, 1936. [Japanese, with English summary.]

The pathogenicity of various strains of the rice blast fungus (*Piricularia oryzae*) [*R.A.M.*, xv, p. 312] used in inoculation experiments on the leaves was definitely lower in the booting than in the seedling stage, but, apart from this, distinct differences were observed in the virulence of the individual strains, of which IX and XIII caused the most severe damage, followed by XXII, XVIII, and XX, which were rather weak, V being extremely feeble, while VII and XVII were innocuous to mature plants. Strain IX was the most injurious to the spike pedicels, followed by XIII, XII, and XXII in the order named. Nos. XX and XVIII were moderately pathogenic to these organs, V weakly so, and VII and XVII of negligible importance. These results are virtually in complete accordance with those obtained on mature plants. In a trial comprising 16 rice varieties from four localities of Japan, strain X was the most strongly pathogenic to all, while an almost equal degree of infection was induced by V and XVIII, the former perhaps being slightly the more virulent. On the basis of seed inoculation tests, using the highly pathogenic strain IX, the most resistant varieties were found to be Igô, Bôzutamagawa, Mubôaikoku, Kamezi No. 3, and Aikoku, Waseôno, Kinaiwase Nos. 68 and 69, and Kômyônisiki being very susceptible, and Toyokuni, Tôgô, and Kinaiwase 22 intermediate in their reaction.

KLETSCHETOFF (A. N.) **New species of Colletotrichum on the rubber-producing plant Taraxacum kok-saghyz Rodin.**—*C.R. Acad. Sci. U.S.S.R.*, N.S., ii, 4, pp. 161–163, 1 fig., 1936.

The author [who transliterates his surname KLEČETOV] gives a brief account of a hitherto undescribed species of *Colletotrichum*, which is named *C. taraxaci* [with a Latin diagnosis], found on brownish spots on the scapes of *Taraxacum kok-saghyz* (a plant which is being experimentally cultivated as a possible source of rubber) in the Kursk area. The oblong or rounded acervuli, 34 to 86 by 20 to 43 μ, are each provided with one to six setae, 116 to 220 by 2·8 μ; the conidia measure 16 to 23 by 2·8 μ in diameter. Preliminary inoculation tests indicated

that *C. taraxaci* is capable of attacking and killing germinating *T. koksaghyz* seeds.

Felsz-Karnicka (Halina). **Rozkład cellulozy w glebach kwaśnych.** [Decomposition of cellulose in acid soils.]—*Mém. Inst. polon. Écon. rur.*, xvi (*1935*), 1, 48 pp., 7 pl., 1 fig., 1 graph, 1936. [French summary.]

A full description is given of investigations in 1933 and 1934 on the soil-inhabiting organisms responsible for the decomposition of cellulose in acid soils in Poland, a preliminary account of which has already been noticed [*R.A.M.*, xv, p. 526]. The results showed that in such soils the decomposition of cellulose is caused, not by bacteria, but, apart from a limited number of Actinomycetes, almost exclusively by fungi, of which 14 species are recorded [all of which are described and figured], viz. *Chaetomium spirale*, *C. kunzeanum* [*C. globosum*], *C. indicum*, *Mycogone puccinioides* [*Monotospora daleae* Mason] (a species characteristic of such soils), *Oedocephalum glomerulosum* [ibid., xii, p. 191], *Papulospora nigra*, *Trichoderma lignorum*, *Stachybotrys lobulata*, *Dicoccum asperum*, *Chaetophoma* sp., *Chaetomium* sp., *Blastotrichum* sp., *Botrytis* sp., and an unidentified species; neither *C. indicum*, *O. glomerulosum*, *P. nigra* nor any of the five last-named appears to have been previously included among cellulose-decomposing organisms. The number of cellulose dissolving fungi in the acid Sobieszyn soils varied from 400 to 4,000 per gm. The application of stable manure and nitrogen fertilizers increased both the soil acidity and the variety and number of the mould flora, while lime and basic fertilizers produced an opposite effect, with a corresponding reduction in the energy of cellulose decomposition. In neutral soils, in which cellulose was decomposed more rapidly and energetically than in acid soils, the process was chiefly due to the activity of bacteria.

Harris (R. V.). **The Verticillium wilt of Hops. Some facts and recommendations.**—*Rep. E. Malling Res. Sta.*, *1935*, pp. 158–162, 1 graph, 1936.

In 1934–5, further cases of the wilt of Fuggles hops caused by *Verticillium albo-atrum* [*R.A.M.*, xv, p. 462] were recorded in England, where seven serious centres of attack have been reported to date. A varying proportion of the bines of affected hills die during the growing season. The affected bines are abnormally thickened, being most conspicuously swollen at the base, but the bark does not become discoloured until the disease has reached a late stage. When the wilt starts in June or July the leaves generally become rapidly and uniformly yellow, then black, those at the base changing colour first; if the condition starts later on in the season, the first symptom is usually an interveinal yellowing and withering of the lower leaves, extending upwards and culminating in a wilting and brown discoloration of the cones. In severe cases all the bines of a hill may be wilted or dead before picking.

Primary infection appears to take place from the soil, and the main seat of the fungus thenceforward is the underground part of the hill. A hill severely affected one year may be free from dead and wilting bines the following year. Records extending over ten years indicate

that the pathogen is found in most of the hills in affected gardens irrespective of the wilting of the bines before picking and that intensity of wilting is primarily related to fluctuations in seasonal and soil conditions. A wet season is accompanied by severe wilt, and vice versa. Preliminary soil surveys of infected gardens showed that a remarkable parallelism exists between the soil structures and textures in all the affected gardens in Kent and Sussex, and that there is a striking correlation between intensity of attack and impedence in soil drainage. Experiments are in progress to ascertain the effect of improved soil drainage on control.

OGILVIE (L.). **Sclerotinia wilt of the Hop.**—*Rep. agric. hort. Res. Sta. Bristol, 1935*, pp. 107–109, 1 pl., [1936].

A detailed account is given of the epidemic outbreak of *Sclerotinia sclerotiorum* on hops in Herefordshire and Worcestershire in 1935 [*R.A.M.*, xiv, p. 792; xv, p. 425]. At the base of wilted bines a straw-coloured area several inches long was found, usually near the ground, and mycelium of the fungus and later sclerotia occurred within the stem. Important factors in the epidemic were probably the presence of the fungus on weeds in the headlands, viz., on nettles [*Urtica*], hemlock [*Conium maculatum*], and hogweed [*Heracleum sphondylium*], and the occurrence of late frosts which injured the bines and permitted wholesale infection to take place. The outbreak died down when the bines recovered from the effects of the frosts. The suppression of weeds, destruction of diseased material, and the uncovering of earthed-up hills to allow the affected bines to dry up, are recommended for purposes of control.

MACLACHLAN (J. D.). **The Pimento rust disease.**—*J. Jamaica agric. Soc.*, xl, 5, pp. 277–281, 1936.

In this preliminary, semi-popular account of the rust (*Puccinia psidii*) [*R.A.M.*, xiv, p. 792] of pimento (*Pimenta officinalis*) in Jamaica, the author states that it takes 14 hrs. from the beginning of germination until the germ-tube successfully penetrates the leaf surface and ten to twelve days more until spores are produced. Two strains of the rust are present in Jamaica, one commonly attacking the rose apple (*Eugenia jambosa*) [*E. jambos*] and infecting otaheite apple (*E. malaccensis*) in the laboratory, and the other occurring on pimento and found also on a single tree of bay rum (*P. acris*); the pathogenicity of the rust to the latter host was confirmed by inoculation experiments. The pimento strain is unable to infect the rose apple, and vice versa, but no morphological differences are apparent between the two strains.

The rust is capable of infecting only young organs, and the presence of young seedling trees therefore assists its spread. Damp weather and a low temperature also favour infection. Laboratory studies showed that the optimum temperature for the infection process is about 60° F.; between 55° and 70° infection was repeatedly obtained, above 70° it was inhibited, and above 80° none took place. These findings are substantiated by the intensity of infection at various altitudes, as shown by data from 82 replies obtained in response to a questionnaire, viz. above 2,000 ft. rust was severe with practically no crop, between 1,000

and 2,000 ft. one-third of the growers reported the rust as affecting the crop yield, severely in a very few cases, and below 1,000 ft. 99 per cent. of the crop has been collected where the rust is either not present or doing no material damage. The author considers that the majority of growers at the low altitudes will not be materially affected by the rust.

As regards control, neither eradication, breeding, nor spraying seem applicable, but the author recommends the removal of dead trees and at low altitudes the cutting out and burning of diseased branches of young trees to prevent blossom infection, a procedure already tested and found efficient. The planting of pimento seedlings in regions not invaded by the rust is not recommended until two years has elapsed and the rust has reached an equilibrium in its ability to spread.

Barbacka (Krystyna). **Helminthosporium na Maku uprawnym (Helminthosporium papaveris K. Sawada).** [*Helminthosporium* on cultivated Poppy (*Helminthosporium papaveris* K. Sawada).]—*Mém. Inst. polon. Écon. rur.*, xvi (*1935*), 1, 14 pp., 2 pl., 4 figs., 1936. [English summary.]

Although this is the first official record of *Helminthosporium papaveris* Sawada [*R.A.M.*, x, p. 206] from Poland, the fungus is stated to be of common occurrence on cultivated poppy (*Papaver* spp.) in the province of Lublin, where it causes a serious damping-off of the seedlings, and also attacks the poppy-heads and more rarely the leaves and stalks. The disease is, however, less severe in Poland than in Bulgaria. In dealing with the morphology of the parasite, it is pointed out that the conidia produced locally measured 20 to 97·by 4·5 to 8·3 μ, as against 12 to 81 by 3 to 6 μ given by Christoff, this difference being believed to be caused by environmental conditions, or possibly to be due to the diversity of the host varieties grown in the two countries. The author further confirmed the genetic connexion between *H. papaveris* and *Pleospora calvescens* [loc. cit.], and accepts Christoff's identification of *P. papaveracea* with it. The fungus often referred to *Dendryphium penicillatum* [ibid., xiii, p. 10] is also undoubtedly the same species.

H. papaveris grows readily on various media but best on poppy decoction plus 2 per cent. glucose with a P_H 6·5 to 7·8. Acidity of the poppy medium decreases during the growth of the fungus, whereas that of a mineral medium increases. Marked variations were observed in the response of different varieties of the cultivated poppy to attack by *H. papaveris*. Wild poppies (*P. rhoeas*) growing close to diseased plants were never seen to be infected, and artificial infection of their heads succeeded only in a very few cases. Poppy seed disinfection with a 0·25 per cent. formalin solution greatly reduced seedling infection. Spraying with Bordeaux mixture also gave a good measure of control but is considered to be uneconomical.

Ingram (J. W.) & Summers (E. M.). **Transmission of Sugarcane mosaic by the rusty Plum aphid, Hysteroneura setariae.**—*J. agric. Res.*, lii, 11, pp. 879–887, 1936.

A summarized account is given of experiments from 1933 to 1935, inclusive, the results of which showed that the rusty plum aphid (*Hysteroneura setariae*) is a vector of sugar-cane mosaic [*R.A.M.*, xv, p. 528].

Although in the experiments it was markedly less effective than *Aphis maidis* in the transmission of the disease (only 24 out of 419 (5·2 per cent.) healthy sugar-cane plants exposed to viruliferous *H. setariae* became infected, as against 17 out of 72 (23·3 per cent.) for *A. maidis*), the facts that it is generally distributed on plums throughout most of the United States, with grasses as alternate hosts, and that it feeds on the sugar-cane (usually at the collar lobe at the junction of the leaf blade and the sheath) throughout the year may account for the specific instances of sugar-cane mosaic spread in early summer, in the total absence of *A. maidis*.

The work also indicated the possibility of the transmission of the sugar-cane mosaic by the green bug (*Toxoptera graminum*), since out of 28 healthy plants exposed to its feeding two contracted mosaic.

McClean (A. P. D.) & Halse (R. H.). **Streak disease of Sugar-cane: its economic importance in South Africa.**—Reprinted from *Proc. S. Afr. Sug. (Tech.) Ass., 1936*, 11 pp., 1 diag., 1936.

An account is given of four years' observations made in South Africa on the prevalence of streak disease [*R.A.M.*, xv, p. 462] in the Uba variety of sugar-cane. An endeavour was made to estimate as accurately as possible the amount of infection present in each district by a method [which is described] necessitating the inspection of only a small proportion of the total number of plants in the district.

Out of a total of 556 fields examined not one contained Uba entirely free from streak. Infection ranged from 2 to 100 per cent. In Zululand, the total areas of plant and ratoon cane showed, respectively, 90 and 92 per cent. infection. In Natal, north of Durban, the corresponding figures were 19 and 26 per cent., and south of Durban 48 and 62 per cent. The [tabulated] data indicate that in the cane area as a whole approximately 60 per cent. of all Uba cane is affected, an increase of nearly 100 per cent. on Storey's estimate of ten years ago.

As Uba, though readily becoming infected, possesses a fair amount of tolerance, the importance of the disease has not been realized sufficiently by most growers, and little or no attempt has been made to prevent transmission by setts. This factor has largely contributed to the prevalence of streak in many districts, though secondary spread by *Cicadulina mbila* must also have played an important part.

The estimated loss in yield for Uba cane in 1934–5, based on the result of the survey and a figure of 11 per cent. loss of weight on the plant crop due to the disease [ibid., iv, p. 123], determined by field experiments at the South African Sugar Experiment Station, amounts to 241,220 tons, valued at £170,864.

Since 1930, eight new commercial sugar-cane varieties have been released in South Africa. Preliminary observations showed that, of these, CH 64/21 is very susceptible, Co. 290 and P.O.J. 2725 are resistant, while P.O.J. 2714, 2727, 2878, and Co. 281 are very resistant. Co. 290, Co. 281, P.O.J. 2878, and P.O.J. 2725 are the most popular of the new varieties, and the control of streak will depend on the amount of resistance they show. The P.O.J. 2878 plants were found to be affected in one locality, but no infection has been observed on Co. 281, P.O.J. 2727 or P.O.J. 2714. Although P.O.J. 2725 and Co. 290 acquire some

infection in the field, their resistance is sufficiently high to enable secondary infection to be reasonably well controlled by direct methods. There is every prospect that the incidence of streak disease will be reduced to negligible proportions when Uba is extensively replaced by these varieties.

Shear (C. L.). **Uniformity and stability of mycological nomenclature.**—*Mycologia*, xxviii, 4, pp. 337–346, 1936.

The author is of opinion that the stabilization of generic and specific names and the fixing of their application are the greatest needs of systematic mycology at the present time. Original generic diagnoses are often inadequate and in many cases no satisfactory description or concept has been attached to a genus until many years have expired, making it very difficult to say when it was 'validly published'. The author maintains that stability and uniformity cannot be attained by the application of the rules of priority but can be accomplished to a great degree by the selection of such type species and specimens as will fix the names as they are generally applied at present. Instances are cited in support of this thesis. The appointment of a standing committee of international systematic mycologists to prepare a list of accepted genera typified by selected types is urged.

Radoslavoff (A.). **VI** приносъ къмъ паразитната гжбна флора на България. [Sixth contribution to the flora of parasitic fungi in Bulgaria.]—*Bull. Soc. bot. Bulgarie*, vii, pp. 51–55, 1936. [German summary.]

A very briefly annotated list is given of 36 species of parasitic fungi, most of which are stated to have been found and studied in herbarium material preserved at the Royal Natural History Museum in Sofia. Mention may be made of *Cystopus bliti* [*R.A.M.*, xi, p. 75] on *Amaranthus retroflexus* and *A. blitum*; *Uromyces pisi* on *Lathyrus pratensis*, a new host in Bulgaria; *Puccinia porri* [ibid., xiv, pp. 423, 735] on *Allium carinatum* and *A. atroviolaceum*, the latter being a new host in the country; and *P. menthae* [ibid., xv, p. 527] on *Mentha viridis*.

Christoff (A.) & Christova (Eleonora). Нѣколко нови растителни болести за България (III приносъ). [Some new plant diseases for Bulgaria. (3rd Contribution).]—*Bull. Soc. bot. Bulgarie*, vii, pp. 7–22, 1936. [English summary.]

This is a briefly annotated list of 34 parasitic fungi, which are stated to be new records from Bulgaria, and among which the following may be mentioned, namely, *Taphrina ulmi* on *Ulmus campestris*, *T. polysporus* on *Acer campestre*, *Uromyces anthyllidis* on *Lupinus angustifolius*, *Puccinia obtusata* on *Ligustrum vulgare*, *Phyllosticta pruni-avium* on *Prunus avium*, *Phoma persicae* on brown, gumming lesions on peach stems [*R.A.M.*, xiv, p. 15], *P. subvelata* on vegetable marrow causing an internal rot of the fruit, *Phomopsis* (*Diaporthe*) *juglandina* on immature fruits of the walnut (*Juglans regia*), *Hendersonia foliorum* on the stems of quince nursery stock (*Cydonia vulgaris*), *H. mali* on the apple, *Septoria secalis* on rye, *Leptothyrium pomi* on the apple, cherry plum (*Prunus divaricata*), and walnut, *Gloeodes pomigena* on the apple, pear,

and plum, *Helminthosporium turcicum* on maize and *Sorghum saccharatum*, *Cercospora violae* on the violet, *Fusarium sclerotium* [*F. scirpi*: ibid., xv, p. 531] on watermelon [*Citrullus vulgaris*] causing a rot of the fruit, and *Sclerotium omnivorum* on groundnut attacking both the collar and the fruits [ibid., xiv, p. 215]. *Nigrospora oryzae* was identified on maize [ibid., xiii, p. 762] and on cotton plants; while this is the first authentic record of this fungus from Bulgaria, the examination of a diseased maize cob preserved at the Obraztzoff regional Agricultural Experiment Station and labelled in 1909 by Bubák under the name *Coniosporium gečevi* [ibid., x, p. 725] showed that the fungus in reality is *N. oryzae*, and the author considers that both names are synonymous. Another herbarium maize cob, collected in 1909 and labelled *Kozarowia majdosperda* Bubák was found to contain *N. oryzae* associated with the former, which is believed to be a secondary organism. The form found on cotton bolls was morphologically very similar to that on maize, for which reason the author refers it to *N. oryzae*, in spite of the fact that a similar fungus has been described by Jaczewski under the name *N. gossypii* [ibid., ix, p. 307].

Wallace (G. B.). **Second list of fungi and diseases of economic plants in Tanganyika Territory.**—*Kew Bull., 1936*, 3, pp. 234–240, 1936.

A further list, arranged in alphabetical order of the hosts, is given of the fungi, bacteria, and diseases (physiological and virus) affecting 50 plants of economic importance in Tanganyika Territory [*R.A.M.*, xi, p. 474], with addenda on three entomogenous fungi and a supplementary list of the living hosts of *Armillaria mellea* [cf. ibid., xv, p. 261].

Höhnk (W.). **On three Pythiaceous Oomycetes.**—*Beih. bot. Zbl.*, lv, Abt. A, 1, pp. 89–99, 4 figs., 1936.

The author retains the genus *Pythiomorpha* [*R.A.M.*, xiv, p. 119] for two of the species (one new) recorded in this paper, considering that it differs from *Phytophthora* in the distinctly constricted intramatrical hyphae, the sexual apparatus, the saprophytic or semi-parasitic mode of life, and the more or less aquatic habitat. The third species is placed in the new genus *Diosporangium* of the Pythiaceae distinguished from *Pythium* in the escape of the zoospores without the formation of a vesicle. It agrees with *Pythiogeton* in the orientation of the sporangium, the longer axis of which is at right angles to the stalk, but differs in the regular, symmetrical shape of the sporangium, the thickening of the wall, in the formation of spores inside the sporangium (the plasma content rarely escaping by a creeping movement) and in the oogonia. The type species *D. jonesianum* was isolated from soil from the United States and Germany and in inoculation experiments readily attacked radish and buckwheat (*Fagopyrum*) [*esculentum*] seedlings. Latin diagnoses of the new genus and species are given.

Tai (F. L.). **Notes on Chinese fungi. VI.**—*Bull. Chin. bot. Soc.*, ii, 1, pp. 16–28, 7 figs., 1936.

Continuing his studies on Chinese Erysiphaceae [*R.A.M.*, xiv, p. 795], the writer gives critical and taxonomic notes on a further 16 species, one of which, *Uncinula cedrelae* on *Cedrela sinensis*, with a var. *nodulosa*

on the same host, is new and is supplied with a Latin diagnosis. The list further includes *Erysiphe polygoni* [ibid., xv, p. 585] on buckwheat and a number of other economic and ornamental plants, *Sphaerotheca humuli* var. *fuliginea* [ibid., xii, pp. 396, 500] on beans (*Phaseolus vulgaris*), *P. mungo*, and cowpea, *Microsphaera alni* [ibid., xii, p. 725; cf. also xiv, p. 795] on *Pistacia chinensis*, *M. yamadai* on walnut, and *U. kenjiana* on *Ulmus pumila*.

GADD (C. H.). **Report of the Mycologist for 1935.**—*Bull. Tea Res. Inst. Ceylon*, 13, pp. 24–34, 1 pl., 1936.

The study of root disease caused by *Poria hypolateritia* [*R.A.M.*, xv, pp. 78, 610] was continued during 1935 at St. Coombs, where evidence was obtained indicating that at least two years may elapse before an infected bush dies. The common procedure of trenching and removal of dead or obviously dying bushes does not effectively control the disease, and more drastic methods are necessary involving the removal of every bush infected at the roots even if the bush appears healthy above ground. The necessity of treating the patch as a whole is emphasized.

A die-back of tea branches during the first year from pruning reported in 1929 was again prevalent in several districts in 1935. *Leptothyrium theae* [ibid., vii, p. 745] was consistently isolated from diseased branches, and inoculations through wounds on young tea shoots maintained in water caused a similar die-back of the shoot. The disease starts as a small depressed spot on the young green branch. Frequently the spots are numerous and affected areas enlarge, encircling the stem and killing the upper part. The fungus advances toward the base and enters the parent branch; when it becomes established at the collar death of the bush is likely to ensue. *L. theae* was frequently isolated from diseased tissue at the collar of such bushes. So far early infections have been found on green stems only.

A new disease of *Crotalaria anagyroides* and *C. usaramoensis* was observed in the Hatton and Maskeliya districts, respectively. The leaves bear numerous irregular spots dark purple or almost black in colour, up to 3 to 4 mm. in diam. Later the leaflets fall leaving the petioles bare. The disease was shown by infection experiments to be caused by a species of *Ceratophorum*. It is considered likely to prove a serious handicap to the cultivation of *Crotalaria* as green manure in certain districts.

Gliricidia was found to be attacked by a disease which caused the formation of sunken spots, dark purple to almost black in colour on branches up to ½ in. in diameter. The cortex over the cankers frequently falls off, exposing the wood. The cankers usually encircle the stems and the upper part of the branch dies. Fructifications of the causal organism, a species of *Phoma* with pycnidia 70 to 150 μ in diameter and oval hyaline spores 6 by 3 μ, are formed on the lesions.

A species of *Phyllosticta* was associated with large blotches on the leaves of *Clitoria cajanifolia* grown as hedges, and *Rosellinia arcuata* [ibid., xv, p. 686] was recorded on roots of *Tephrosia vogelii*.

In experiments on wood rot the ambrosia fungus and *Nectria haematococca* [ibid., xiv, p. 742] isolated from discoloured wood failed to induce wood rot unaided.

CARPENTER (P. H.). **Report by the Chief Scientific Officer, Indian Tea Association, 1935 (Resumé).**—12 pp., 1936.

In the section of this report dealing with mycology (pp. 6–8) the author states that in 1935 black rot [*Corticium invisum* and *C. theae*: *R.A.M.*, x, p. 345] of tea caused serious losses in some gardens in north-eastern India, but in most localities was inexpensively controlled by prompt treatment with 1 per cent. Burgundy mixture. Experimental evidence indicated that 4 per cent. Burgundy mixture gave complete control of the disease, while concentrations of 1 and 2 per cent. very greatly reduced infection.

The death of many tea bushes was associated with violet root rot (*Sphaerostilbe repens*) [ibid., xv, p. 271] on very stiff, and *Diplodia* disease [*Botryodiplodia theobromae* secondary to physiological causes: ibid., viii, p. 746; x, p. 345; xi, p. 768] on very sandy, soils. Both conditions appear to be associated with lack of starch reserves in the tea bushes due to excessive reduction in leaf area as a result of heavy plucking or premature defoliation.

The incidence of brown blight (*Glomerella cingulata*) [ibid., xiv, p. 721] attack was ascertained to vary with the severity of plucking. Manuring appeared to have no effect on the proportion of blighted to total leaves below the plucking level, though bushes given 80 lb. nitrogenous manure per acre had smaller starch reserves than others given half this quantity or none at all. [The full report is published in *Rept. mycol. bot. bact. Br., Indian Tea Ass., 1935*, pp. 1–22, 1936.]

BÖNING (K.). **Die wichtigsten Krankheiten des Tabaks.** [The most important diseases of Tobacco.]—*Nachr. SchädlBekämpf., Leverkusen*, xi, 2, pp. 53–86, 24 figs., 1936. [English, French, and Spanish summaries on pp. 105–106, 107–108, 110–111.]

Semi-popular notes are given on the etiology, symptomatology, and control of a number of important fungal, bacterial, virus, and physiological diseases affecting the tobacco crop in Germany and Central Europe generally.

BELTYUKOVA (Mme K. I.) & POPOVA (Mme A. A.). Бактериальное увядание Махорки. [Bacterial wilt of Indian Tobacco.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна (ВИТИМ)* [*The A. I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 57–63, 1936.

Bacterial wilt (*Bacillus carotovorus*) [*R.A.M.*, xiv, p. 658] occurred in epidemic form in 1932 on *Nicotiana rustica* in several Indian tobacco-growing areas of European Russia and in West Siberia, infection varying from 4 to 12 per cent., and being most severe on heavy and moist loam soils. It was experimentally shown that the organism is capable of infecting Indian tobacco through stem wounds and from suspensions placed in the leaf axils, and there was clear evidence that topping the plants may play an important part in the distribution of the wilt. Low air temperatures and high humidity appear to favour the development of the disease. Considerable variations were noticed in the varietal susceptibility of Indian tobacco, the varieties with compact and firm

stems of the Vyssokoroslaya Zelionaya [Tall Green] type showing the highest resistance.

Lebedeva (Mme O. P.), Samotzvetova (Mme E. A.), & Beltyukova (Mme K. I.). О бактериальной рябухе Махорки и сигарного Табака и возбудителях ее. [Bacterial 'ryaboukha' of Indian Tobacco and cigar Tobacco, and its causal agents.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*). [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 5–16, 1936.

The results of studies made in 1931 in the Ukraine and central and south-west Russia showed that of the three forms of bacterial 'ryaboukha' [*R.A.M.*, x, p. 627] present there the most widespread and destructive is that which isolations and inoculations have proved to be caused by *Phytomonas tabaca* [*Bacterium tabacum*: ibid., xv, p. 536]. The organism attacks Indian tobacco (*Nicotiana rustica*) plants at all stages of growth, and forms lesions on the leaves and seed capsules of both tobacco and Indian tobacco. The two forms of the disease, caused by *P. heterocea* [ibid., x, p. 628] and *P.* [*Bact.*] *pseudozoogloeae* [ibid., xiv, p. 659], respectively, only occur locally and sporadically, and do not appear to be of economic importance.

Samotzvetova (Mme E. A.). Семена, как источник заражения бактериальней рябухой. [Seeds as carriers of bacterial 'ryaboukha' infection.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 51–56, 1936.

The results of the laboratory and field experiments briefly discussed in this paper showed that the seeds of Indian tobacco (*Nicotiana rustica*) from plants infected with one of the forms of bacterial 'ryaboukha' (*Phytomonas tabaca* [*Bacterium tabacum*], *P. heterocea*, or *Bact. pseudozoogloeae*) [see preceding abstract] become contaminated in threshing with the corresponding bacterial organism. The latter remains viable on the surface of the seeds until the next sowing time, and may cause infection of the resulting Indian tobacco seedlings; *Bact. tabacum* was also shown to lower the germinability of the seeds by rotting the developing germ. Surface sterilization of infected seed with 0·1 per cent. mercuric chloride, followed by rinsing in sterilized water, effectively controlled the disease.

Obermeister (N. P.). Определение Bact. tab. серологическим методом. [Serological determination of *Bacterium tabacum*].—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 127, pp. 35–47, 3 figs., 1 graph, 1936. [English summary.]

Details are given of serological studies, the results of which showed that strains of *Bacterium tabacum*, *Phytomonas heterocea* [see preceding abstracts], and *Bact. angulatum* [*R.A.M.*, xv, p. 613], obtained from various leaf spots on tobacco and Indian tobacco (*Nicotiana rustica*)

from different regions in the U.S.S.R., were serologically indistinguishable from one another, inasmuch as each was agglutinated by rabbit serum immunized against the others. It is therefore concluded that the three species are identical [cf. ibid., x, p. 62] though biochemically the three organisms vary in their production of hydrogen sulphide or ammonia, or in the reduction of nitrates. The author considers that the serological method may be usefully employed in the diagnosis of tobacco leaf spots, as well as in the microbiological analysis of tobacco seeds, on which *Bact. tabacum* was shown to retain its viability for at least two years.

Beltyukova (Mme K. I.) & Lebedeva (Mme O. P.). О специализации **Phytomonas tabaca Wo. and Fo.** на некоторых растениях хозяевах. [On the specialization of *Phytomonas tabaca* Wolf & Foster on certain host plants.] *Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 17–34, 1936.

The results of investigations from 1930 to 1933, inclusive, showed that in the U.S.S.R. tobacco fields *Phytomonas tabaca* [*Bacterium tabacum*: see preceding abstracts] occurs on the weeds *Amaranthus retroflexus*, *Euphorbia virgata*, *Agrostemma gitago*, and *Chenopodium album*, and *P. heterocea* [loc. cit.] on *Lappa major*, *Trifolium arvense*, and *C. album*; the strains of both bacteria isolated from these hosts were pathogenic to Indian tobacco (*Nicotiana rustica*). Inoculations through wounds or on uninjured plant surfaces showed that *Bact. tabacum* is also pathogenic to 45 host species [*R.A.M.*, xv, p. 678], belonging to 14 families, and including the potato, tomato, *Solanum nigrum*, *Datura stramonium*, *Hyoscyamus niger*, cucurbits, sunflower, beet, French bean (*Phaseolus vulgaris*), soy-bean, and opium poppy.

Lebedeva (Mme O. P.) & Beltyukova (Mme K. I.). Жизнеспособность и вирулентность **Phytomonas tabaca** в главнейших источниках заражения в условиях зимовки. [Viability and virulence of *Phytomonas tabaca* overwintering in materials providing the principal sources of infection.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 126, pp. 35–49, 1936.

A brief but fully tabulated account is given of experiments in 1931 and 1932, the results of which showed that *Phytomonas tabaca* [*Bacterium tabacum*: see preceding abstracts] retains its viability throughout the winter in sterilized soil, dry tobacco leaves, and in decomposing plant materials both on and under the surface of the soil; it rapidly dies out in unsterilized soil and completely rotted plant tissues. The virulence of the organism is fully maintained in dry leaves, on the surface of tobacco seeds, and sometimes also in semi-rotted plant refuse. On the other substrata tested, e.g., glass slides, wood, and straw, the virulence is considerably attenuated or completely destroyed, but lowered virulence may be increased by several passages of the bacterium through tobacco.

Grooshevoy (S. E.) & Levykh (P. M.). Влияние температуры и влажности почвы на развитие главнейших грибных болезней Табачной рассады. [Effect of soil temperature and moisture on the development of the principal diseases of Tobacco seedlings.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 127, pp. 5–18, 1936. [English summary.]

A detailed account is given of controlled experiments on the effect of soil moisture content and temperature on the development and injuriousness of *Thielaviopsis basicola*, *Rhizoctonia* sp., *Pythium* sp. [*R.A.M.*, xv, pp. 178, 613], and *Asterocystis radicis* [ibid., xv, p. 531], which, together with *Botrytis cinerea*, are stated to be the most frequently associated in the U.S.S.R. with damping-off of tobacco seedlings in glasshouses. The results showed that *T. basicola* was equally destructive at all the soil humidities (40 to 100 per cent.) tested, and caused the heaviest losses at soil temperatures between 16° and 19° C. The optimum for *Rhizoctonia* sp. was soil humidity from 60 to 80 per cent. and temperatures from 22° to 25°; no attack of the seedlings occurred below 10°. *Pythium* sp. and *A. radicis* were most destructive near the soil moisture saturation point, the optimum temperatures being 16° to 19° for *Pythium* sp. and 16° to 25° for *A. radicis*.

Grooshevoy (S. E.) & Levykh (P. M.). Термический метод обеззараживания парникового субстрата. [Thermal method for the disinfection of seed-bed soil.]—*Всесоюзн. научно-исслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна* (*ВИТИМ*) [*The A. I. Mikoyan Pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 127, pp. 19–34, 2 figs., 1936. [English summary.]

A tabulated account is given of experiments in 1934 and 1935, the results of which showed that effective control of damping-off of tobacco seedlings due to *Thielaviopsis basicola* [see preceding abstract] is obtained by heating the compost used in the seed-beds at 85° to 95° C. for one hour provided only chlamydospores are present, or for 45 minutes at 100° if the compost contains dried tobacco seedlings infected with the fungus. *Sclerotinia* sp. was killed by heating at 60° for 30 minutes, *Rhizoctonia* [*Corticium*] *solani* at 80° for 30 minutes, and *Asterocystis radicis* at 100° for 45 minutes. In the case of *T. basicola* the depth of the sterilized layer should not be less than 8 to 10 cm. It is pointed out that sterilization of the prepared compost is more effective than that of its components separately [cf. *R.A.M.*, xv, p. 461], and that if sterilized compost is allowed to stand for some length of time, the surface layer to a depth of 5 cm. should be again treated before making up the seed-beds.

Price (W. C.). **Virus concentration in relation to acquired immunity from Tobacco ring spot.**—*Phytopathology*, xxvi, 6, pp. 503–529, 4 figs., 1936.

A fully tabulated account is given of the writer's continued studies

on virus concentration in relation to acquired immunity from tobacco ring spot [*R.A.M.*, xii, p. 120; cf. also ibid., xv, p. 533].

By growing cuttings from recovered plants through a series of ten generations and subsequently testing for ring spot virus, the latter was shown to multiply in such plants. Using the number of primary lesions produced in Black cowpea leaves as a measure of virus concentration, leaves from diseased plants were found to contain on an average from 5 to 10 times as much as recovered foliage. Measurements of virus concentration in partially recovered tobacco leaves affected by ring spot showed that the apparently sound basal portions contain considerably less than the diseased apical parts, while fully recovered foliage contained more virus than the apparently healthy parts of semi-recovered leaves. Heavy inoculations of recovered leaves with the ring spot virus did not appear to increase the content of the latter, which was about five times as high, however, five days after inoculation in healthy leaves of the same age, inoculated simultaneously, as in either the inoculated or untreated recovered foliage. There was significantly more virus in the roots of diseased than in those of recovered plants, while the latter, grown from cuttings through ten generations, contained much less of the infective principle than diseased, and somewhat less than newly recovered plants. Generally speaking, leaves inoculated with undiluted virus contain more of the infective principle than systemically diseased ones, partly on account of the numbers of necrotic lesions in the former, to which the virus content of a given inoculated leaf was shown to be roughly proportional. Considerable variations were observed in the reaction of cowpeas grown under different conditions to inoculation by the ring spot virus.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements, January–March, 1936.—pp. 4–5, 18–26, 33–39, 1936.

Particulars are given of the extension of the Dutch elm disease [*Ceratostomella ulmi*] quarantine (No. 71) [*R.A.M.*, xiv, p. 480 and above, p. 692] as from 31st March, 1936, to 26 new townships in New Jersey and 13 in New York, as well as of amendment No. 1 to the rules and regulations supplemental to notice of quarantine No. 71, defining the regulated areas to which the provisions of the notice in question are applicable.

A reprint, with corrected footnotes and appendices, is given of Quarantine No. 37, relating to nursery stock, plants, and seeds [ibid., ix, p. 688; x, p. 288], incorporating the revised regulations 3 (defining the nursery stock, including seeds, the importation of which necessitates a permit) and 7 (dealing with certification, marking, freedom from sand, soil, or earth, and approved packing material) effective as from 14th January, 1935.

Summaries are given of the plant quarantine import restrictions in force in Palestine, the Grand Duchy of Luxembourg, Sierra Leone, and the Gold Coast. It is also stated that during 1935 the importation of potatoes into Czecho-Slovakia was prohibited except from Italy, Hungary, Spain, Jugo-Slavia, and (by special permit only) the Netherlands, Canada, Germany, Poland, and Austria, with a view to the exclusion of wart disease (*Synchytrium endobioticum*) [ibid., viii, p. 664].